AGRICULTURAL *Chemicals*

1959 - 1960 BUYER'S GUIDE

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- No Nitrogen Granulation
- Pesticide Toxicity Values
- Trade Credit Practices
- Co-Ral Spray Characteristics
- Granular Pesticide Patent
- What's New in Orchard Pesticides
- Fertilizer Manufacturing Techniques
- Applying Liquid Fertilizers

SEPTEMBER, 1959

If "bloom" and "creaming-rate" tests told the whole emulsifier story, formulating liquid concentrates would be comparatively simple. But they fail to measure the storage stability of emulsifiable concentrates under the hot Texas or California sun.

That's why Witco builds unsurpassed storage stability right into its Emulsol EMCOL H-300X and H-500X emulsifiers. These two outstanding emulsifiers are balanced for wide range function...have ten or twelve components specially designed to give your concentrates top-notch emulsification under difficult field conditions.

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Agricultural Chemicals

1959-1960

BUYER'S GUIDE

This Month's Cover

A special feature of this issue of *Agricultural Chemicals* is the 1959-60 annual Buyers' Guide (pages 69-89), with a separate listing of equipment and supplies for the Agricultural Applicator (pages 90-92).

Vol. 14, No. 9 September, 1959

AGRICULTURAL Chemicals

ARTICLES

FEATURES

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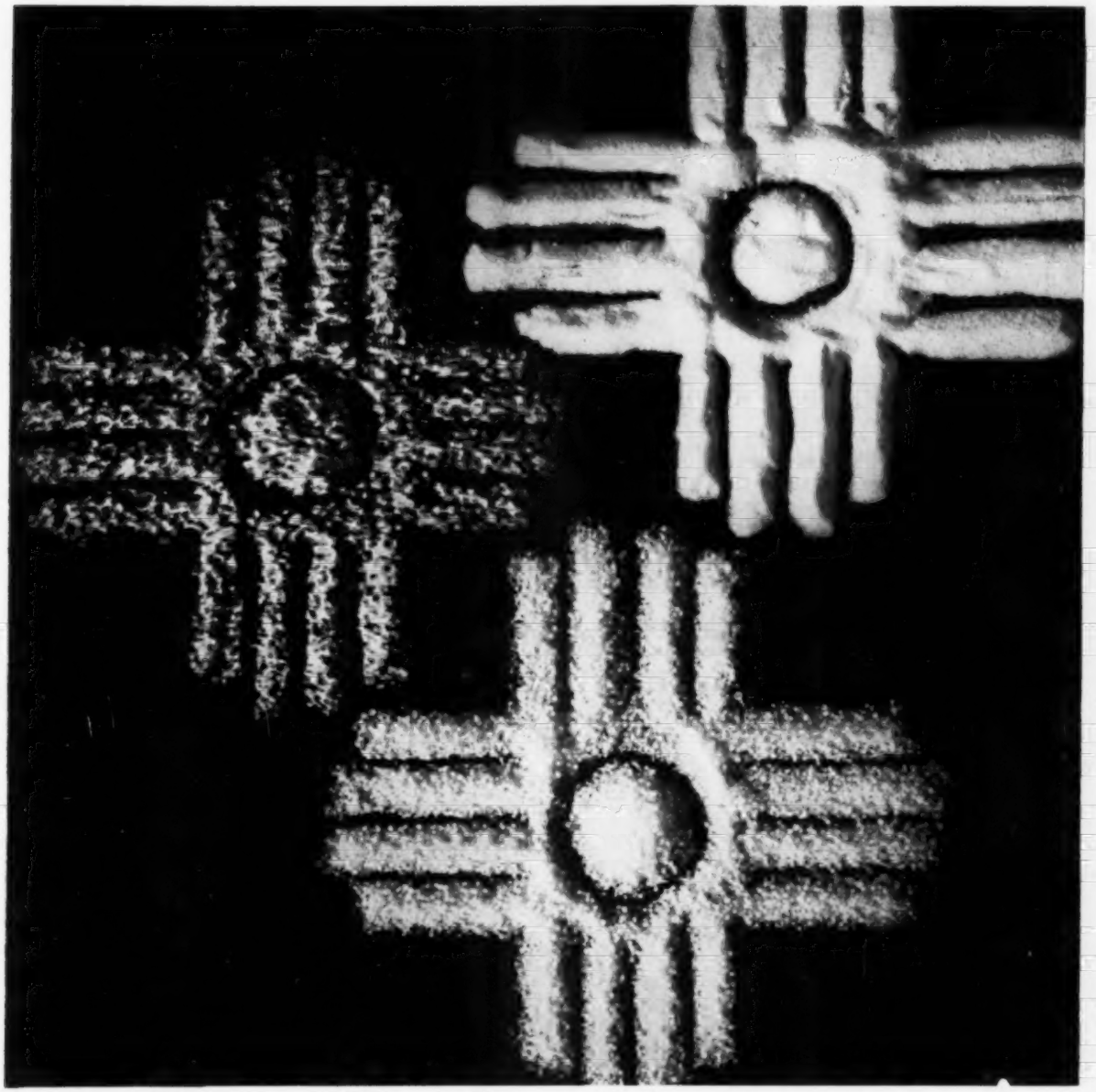

Better fertilizers begin with three top quality grades of USP potash

For the manufacture of all modern fertilizers, USP offers *three* outstanding grades of potash: two white grades—Higrade muriate and Higrade Granular muriate—each containing 62/63% K_2O, and each specially sized to meet current fertilizer manufacturing requirements. These white muriates give you the most potash per ton for mixed fertilizers. And USP's Granular muriate, containing 60% K_2O, is ideally suited for fertilizer uses requiring a still larger particle size. All three grades resist caking and remain free-flowing for easy storing and handling.

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THESE MEN HAVE LEARNED FROM EXPERIENCE THAT TOXAPHENE MAKES DOLLARS...AND SENSE

Hartford Jackson, Columbia, La. *"I set about the best cotton crop I have ever seen, following the toxaphene, toxaphene-DDT control program . . ."*

P. E. Cloutier, Bermuda, La. *"We set one of our best crops last year, and we think the toxaphene, toxaphene-DDT insect control program was a big factor. We're basing our 1959 program on the same plan . . ."*

D. L. Hall, Eudora, Ark. *"The toxaphene and toxaphene-DDT control program certainly worked for me, and made me money . . ."*

Morris A. Roberson, Gilliam, La. *"I like the early production and early harvest that comes with the toxaphene insect control program. We had good control all season, and I plan to use the same program this year . . ."*

W. E. Moore, Sherrill, Ark. *"We were able to pick cotton two weeks earlier on the acreage where we followed this program. It really paid off for us . . ."*

Clarence R. Smith, Cleveland, Miss. *"We believe in this program. It gave us excellent insect control, saved us money, and helped us make a cotton crop under adverse conditions . . ."*

H. C. Bradney, Montrose, Ark. *"This program saves me expensive late-season applications and does an excellent job. Last year I cut my insect control costs in half . . ."*

O. L. Garmon, Jr., Marks, Miss. *"I used the toxaphene program on more than 700 acres of cotton. I know you need to get the overwintered boll weevil, and this program does that. I had good insect control all year . . ."*

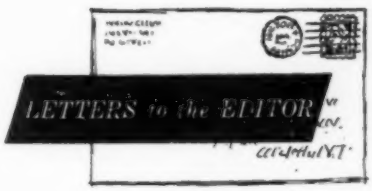
O. L. Cox, Ruleville, Miss. *"I got on the toxaphene program early in the season and continued on a regular schedule. I believe those six early applications paid more dividends than anything we did with our cotton crop all year long . . ."*

Insecticide salesmen have to do more than just take orders for dusts and sprays. In the Mid-South, for example, progressive formulators and dealers are showing cotton farmers how a planned, season-long insect control program based on toxaphene can be the most satisfactory—and profitable—practice. These statements from farmers already following such a program reflect the growing interest in more effective use of insecticides.

N450-8

TOXAPHENE

A product of the Agricultural Chemicals Division
HERCULES POWDER COMPANY
INCORPORATED
900 Market Street, Wilmington 99, Delaware



Through Mr. J. F. Wischhusen of Cleveland, Ohio, we have learned that you published in June an article: "Testing the Organic Theory," by Dr. Vincent Sauchelli, chemical technologist of the National Plant Food Institute.

Would you grant us permission to reprint the article in our magazine, a copy of which is enclosed, and be kind enough to send us tear sheets for copy.

While ridicule has made vegetarians appear as crackpot carrot-nibblers, such is by no means the truth. Vegetarianism is a way of life and diet is but a minor part of our belief. However, we do not eat meat but depend on the soil for our sustenance. And in the last few years the "organically-grown" food movement has, we suspect, been overdone in an attempt to peddle foodstuffs to our honest and sincere people.

The deeper we get into the subject the more firmly we are convinced that the so-called organic grower is being capitalized on to further a racket.

We believe you will be doing our readers a real service by granting us permission to reprint Dr. Sauchelli's article, with due credit, of course.

Francis W. Hilton
AMERICAN BETTER HEALTH PUBLICATIONS
Arroyo Grande, California

I am interested in the use of liquid seed dressings for the control of seed borne diseases of cereals, and especially in the types of seed dressing machines used in the United States for this purpose.

I shall be very grateful if you can give me some information on the most efficient machines used in the United States to apply liquid seed dressings, and perhaps express an opinion as to which is the most efficient.

K. Heslop
BRITISH SCHERING LTD.
London, England

We are trying to locate the manufacturers of "VooDoo Ant Tape," but despite inquiries by ourselves, various business organizations and the Association of British Manufacturers of Agricultural Chemicals, we can find no British manufacturers of this product.

As the original inquiry came from the West Indies it is possibly a local product, however, "VooDo Ant Tape" may be American in origin in which case you may be able to help us.

If you can trace the manufacturers and let us know their address, we would be very grateful.

A. K. Palmer
PEST TECHNOLOGY
Manchester 4, England

In the Spotlight this Month

- **No Nitrogen Granulation** . . . Addition of phosphate rock and sulfuric or phosphoric acid in the formulation of no-nitrogen fertilizer grades contributes to successful production of granular fertilizers. Page 36.

- **Pesticide Toxicity** . . . The LD_{50} values for some 40 commercial pesticides are compiled. Page 44.

- **Fertilizer Manufacture** . . . Plant production men discuss the advantages and disadvantages of spraying or dribbling phosphoric acid on the rolling bed in an ammoniator. Page 41.

- **New Pesticides** . . . Apple orchardists report good results with Sevin in thinning apples; Tedion is the only material providing commercial control of two-spots; Bayer's 30686 is promising for killing mites, but damages fruit and foliage. Page 46.

- **Reader's Digest** . . . Further checking, shows *Reader's Digest* record in dealing fairly with pesticide industry products has been quite good. Page 50.

- **Cattle Grub Control** . . . Correct technique in spraying is a very important factor in getting good cattle grub control, since it is essential that adequate pesticide reach the skin of the animals. This article is a discussion of spray characteristics of Co-Ral, a systemic for control of cattle grubs. Page 39.

- **The Agricultural Applicator** . . . The section contains a report on the handling of complete liquid fertilizers that covers the various methods for application—a report on the use of helicopters to treat cranberries in Massachusetts—and photos of the new Potts mist blower. Page 53.

same day shipment

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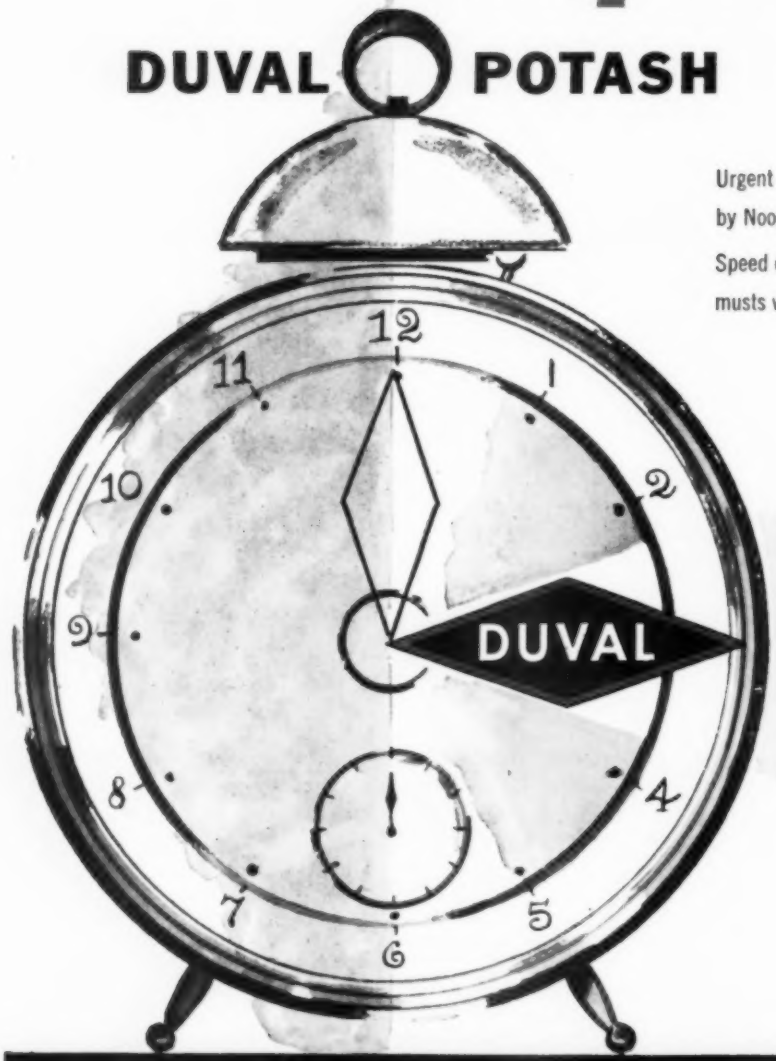

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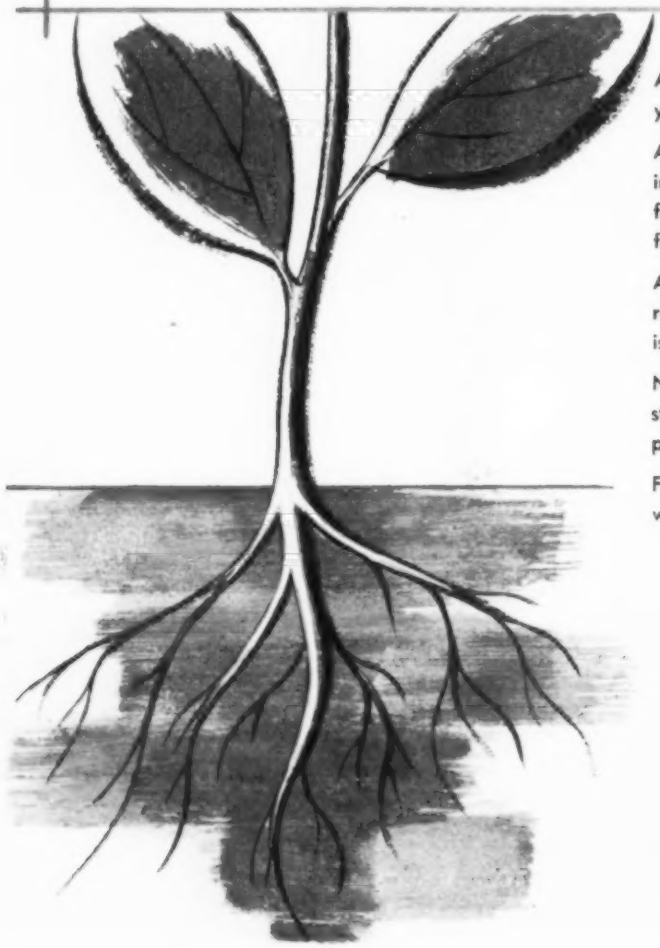

A small amount of NACCONOL can work wonders for your product . . . wet or dry!

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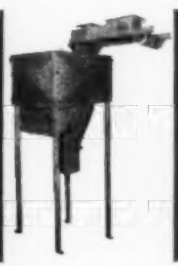
Open-Mouth Bag Filling Machine provides maximum accuracy and speed. May we tell you about our stainless steel models? Remarkable in performance. Surprisingly low in price.



☐ We are interested in improving our bag.
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Aromatic Solvents

For any type of insecticide you want to formulate, there is a PANASOL Aromatic Solvent to fit your need—that will let you formulate quality products competitively priced. PANASOL Solvents blend easily with commercially available emulsifiers to form stable insecticide concentrates.

PANASOL RX-4 and AN-2K have the low phytotoxicity necessary for insecticide solvents. The low odor and light, clear color of PANASOL AN-2 makes it suitable for household sprays. PANASOL AN-1 and AN-3 are excellent solvents for such specialty formulations as insecticide-fertilizer combinations.

Like more information? Your Amoco Chemicals salesman has it. Or write for Bulletin A-2. Your inquiry will receive immediate attention.

Typical Properties

PANASOL Solvent No.	AN-1	AN-2	AN-2K	AN-3	AN-5K	RX-3	RX-4
Distillation 2F., ASTM	D-158	D-158	D-158	D-158	D-158	D-86	D-850
IBP, °F.	400	420	398	450	440	276	282
EP, °F.	494	520	525	534	705	—	—
DP, °F.	—	—	—	—	—	360	320
Specific Gravity, 60/60°F.	0.974	0.986	0.950	0.997	0.943	0.843	0.865
Aromatics, Vol. %	98	99	82	99	71	76	94
Mixed Aniline Point, °F.	55	54	75	54	100	84	59
Flash Point, COC., °F.	190	210	200	225	220	—	—
Flash Point, TCC., °F.	—	—	—	—	—	82	85
Solubility*							
DDT (tech.)	39	42	39	43	28	25	29
BHC (tech.)	29	34	41	31	43	23	28
Lindane	9	10	11	14	5	10	15
Dieldrin	26	28	26	27	25	26	29

*Wt. parts in 100 parts solution at 32° F.

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The LINE RIDER cuts 'em down to size!

When there's brush to be controlled, get The Line Rider. He's a killer . . . perfect for the new broadcast cane-application technique (ask us for details) or for regular kinds of application.

Applied from October through February, The Line Rider controls even the toughest brush . . . oak, maple, for instance. Great for stump applications, too.

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FOR MIXED BRUSH—Line Rider LV-3D/3T . . . a 2-Ethyl Hexyl Ester formulation of 2, 4-D and 2, 4, 5-T containing 3 pounds each of acid equivalent per gallon.

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FOR SPECIAL CONDITIONS—Available are other standard Line Rider formulations, including Butyl and Low Volatile Esters of 2, 4-D and 2, 4, 5-T containing 4 pounds of acid equivalent per gallon.

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NEW Tedion®

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Mites meet their master in Tedion. This remarkable new development kills mites in all stages. And Tedion gives the longest lasting control. In fact, prolonged field tests by leading agricultural institutions have demonstrated effective mite control for upwards to one year after application. So, in consideration of Tedion's long, long residual action, there is nothing as economical to use.

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TEDION

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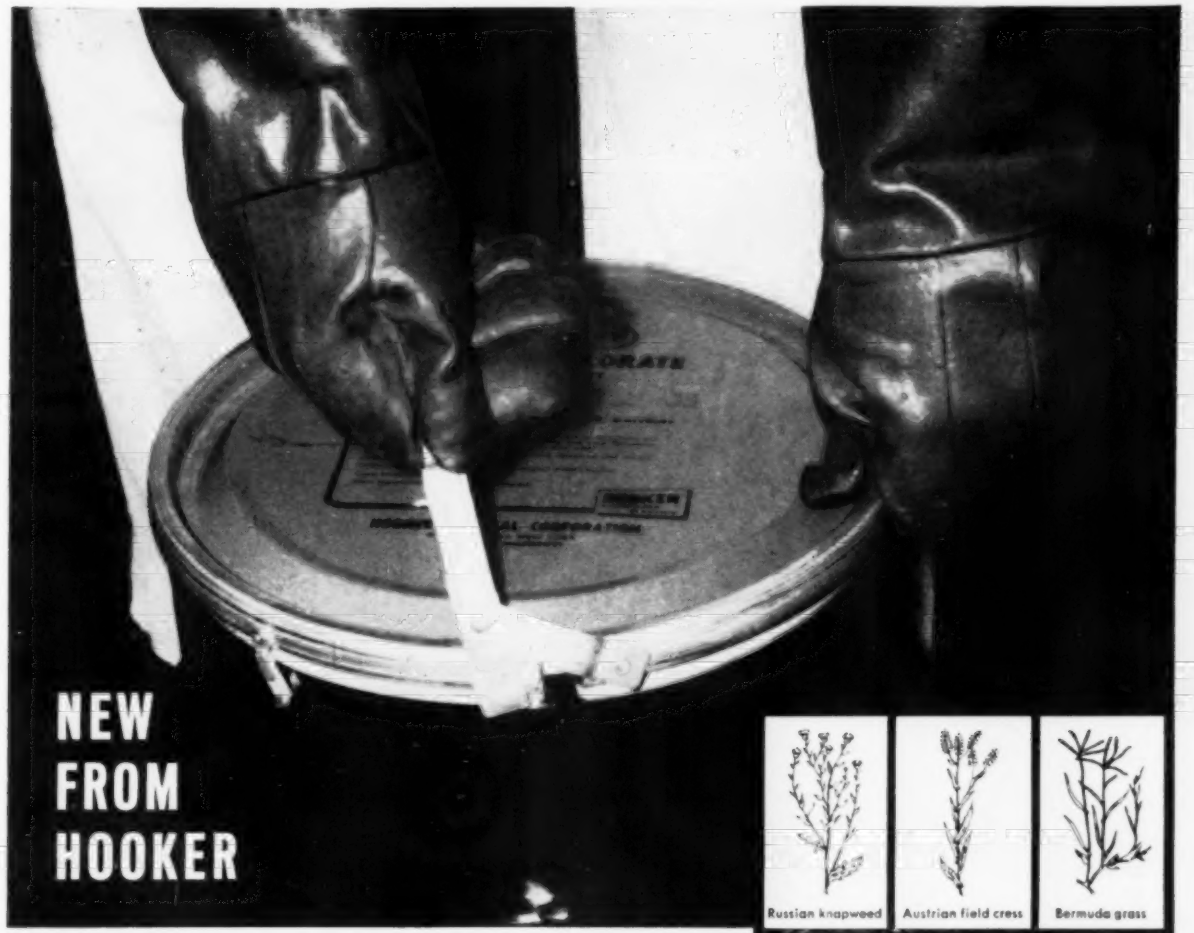

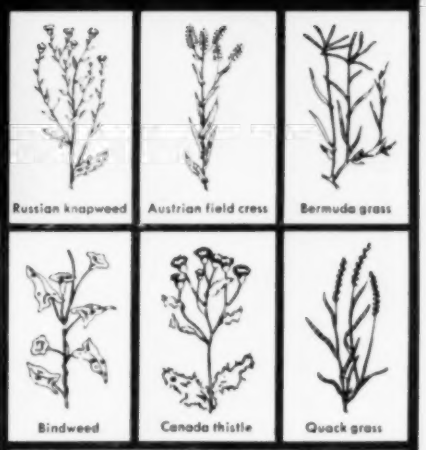

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Kill **all** these weeds with **one** herbicide

You don't have to stock several chemicals to keep your land free of weeds. Hooker sodium chlorate gets rid of all weed, it sterilizes the soil completely.

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New WONDERWALL	
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Saving	40# Paper Basis Weight

Even though lighter, WONDERWALL resists breakage better because it's made with Kraftsman Clupak*, the extra-strong kraft with the built-in *stretch*.

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*Clupak, Inc.'s trademark for extensible paper, manufactured under its authority.

West Virginia Pulp and Paper

WHICH AGRICULTURAL SPRAY WORKS BEST?

THE ONE WITH National Sticker

FREE!

"National Sticker for agricultural sprays" gives various detailed results of tests of National Sticker used with various types of insecticides, nutrient sprays, weed killers and repellents. For your free copy of this booklet, write:

Independent tests conducted at the University of Delaware and other agricultural colleges and experimental stations all over America have shown that National Sticker increases the effectiveness of agricultural sprays. National Sticker improves spray retention on plants, helping prevent crop damage, increasing yield, and gives excellent results in seed treatment. National Sticker proved more effective than competitive brands tested.

National Sticker is compatible with most materials commonly used in agricultural sprays, mixes easily without diluting or pre-mixing, can be used in either hand or power operated sprayers without nozzle-clogging. Write for additional information on advantages, features and uses of National Sticker.

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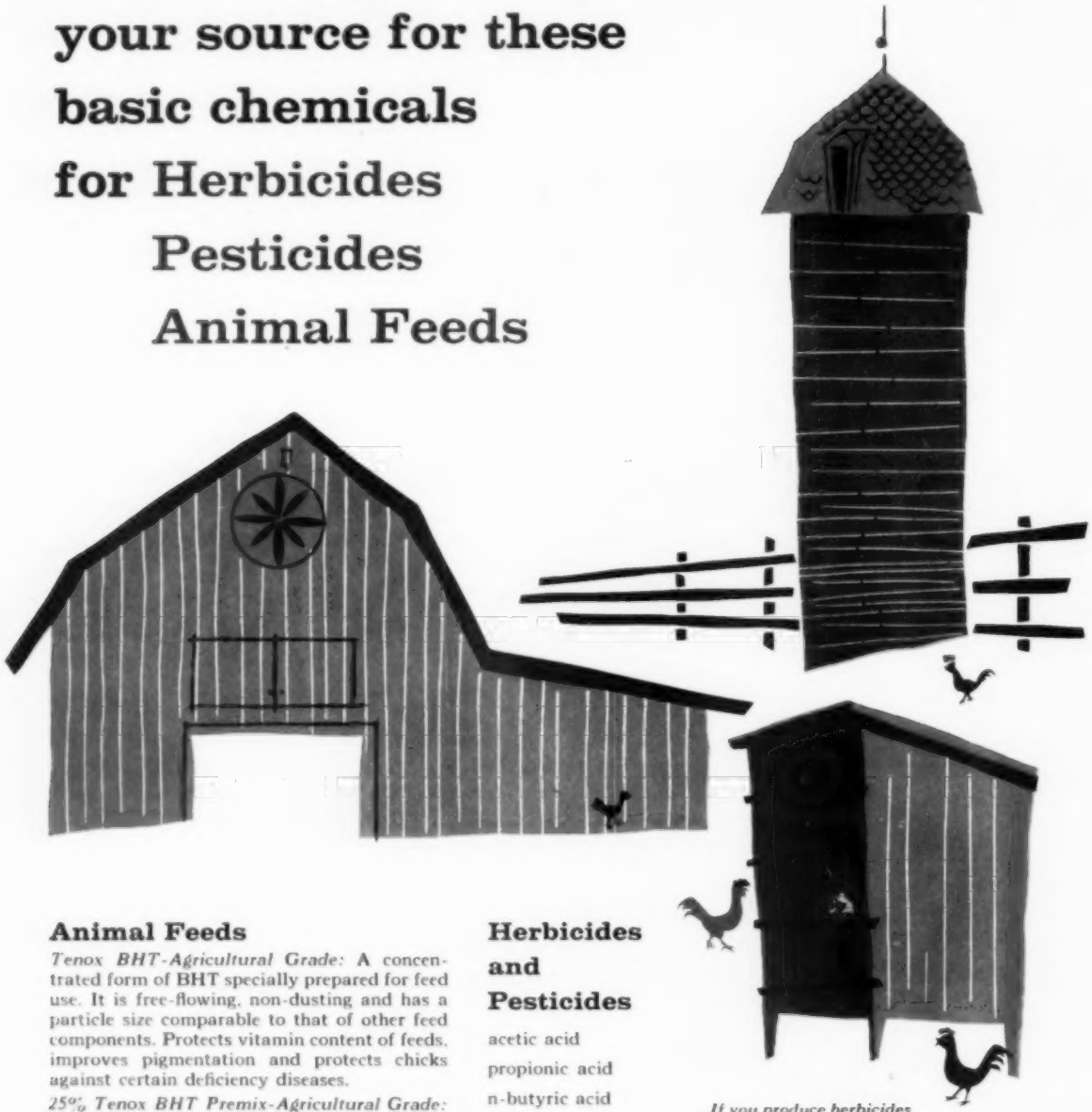

Animal Feeds

Tenox BHT-Agricultural Grade: A concentrated form of BHT specially prepared for feed use. It is free-flowing, non-dusting and has a particle size comparable to that of other feed components. Protects vitamin content of feeds, improves pigmentation and protects chicks against certain deficiency diseases.

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Tenox R: An easy-to-handle, fat-soluble formulation of butylated hydroxyanisole(BHA) and citric acid for stabilizing inedible fats used in feeds and feed supplements.

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Herbicides and Pesticides

acetic acid
propionic acid
n-butyric acid
isobutyric acid
2-ethylhexoic acid
ethyl alcohol
isobutyl alcohol
2-ethylhexyl alcohol
2-ethylisohexyl alcohol
isobutyronitrile
manganese sulphate (Tecmangam®)
triethyl phosphate

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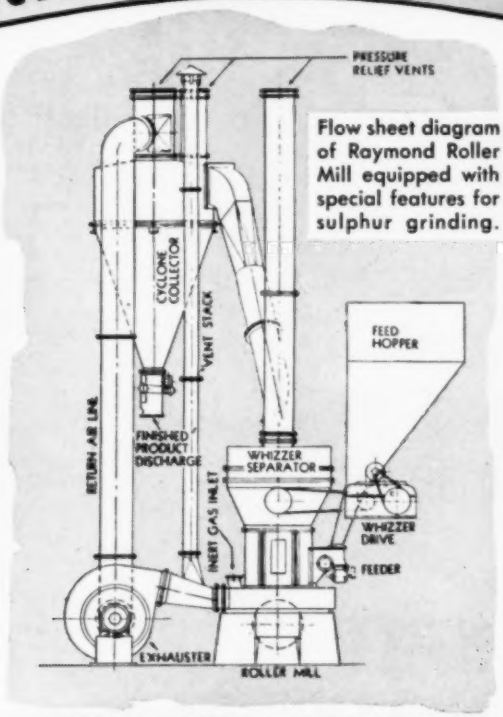

Flow sheet diagram of Raymond Roller Mill equipped with special features for sulphur grinding.

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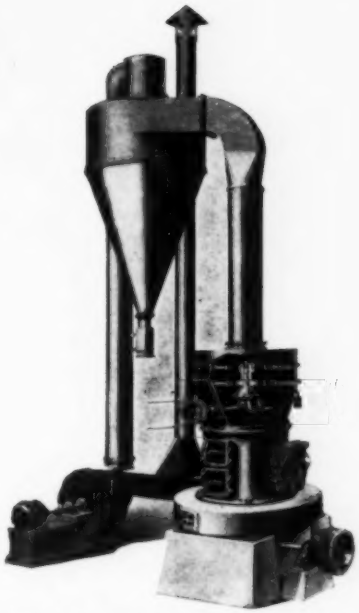

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American Chemical Society, 1155 16th St., N. W., Washington, D. C.

Association of Official Agricultural Chemists, P. O. Box 540, Benjamin Franklin Station, Washington, D. C. William Horwitz, secretary-treasurer.

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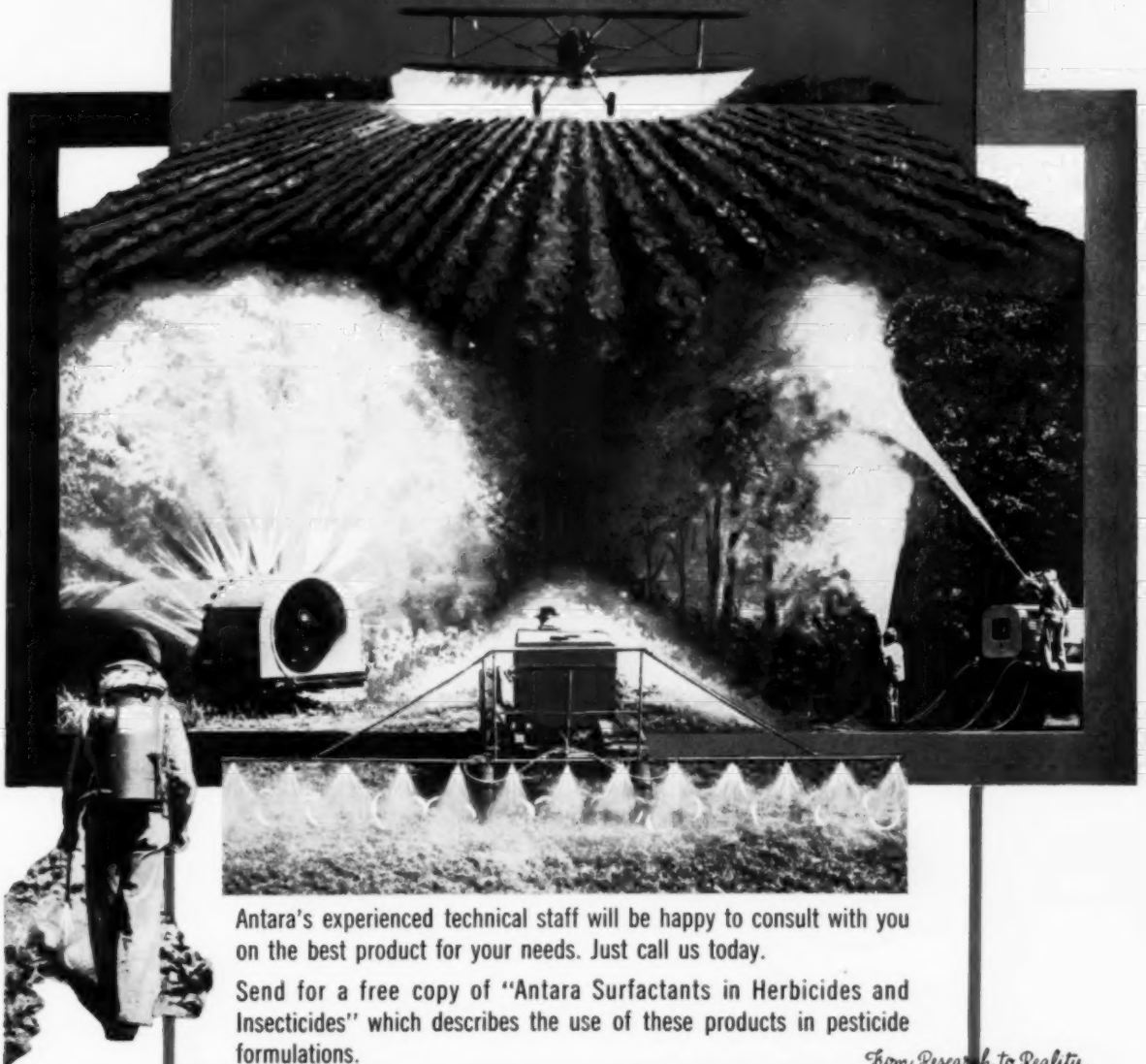

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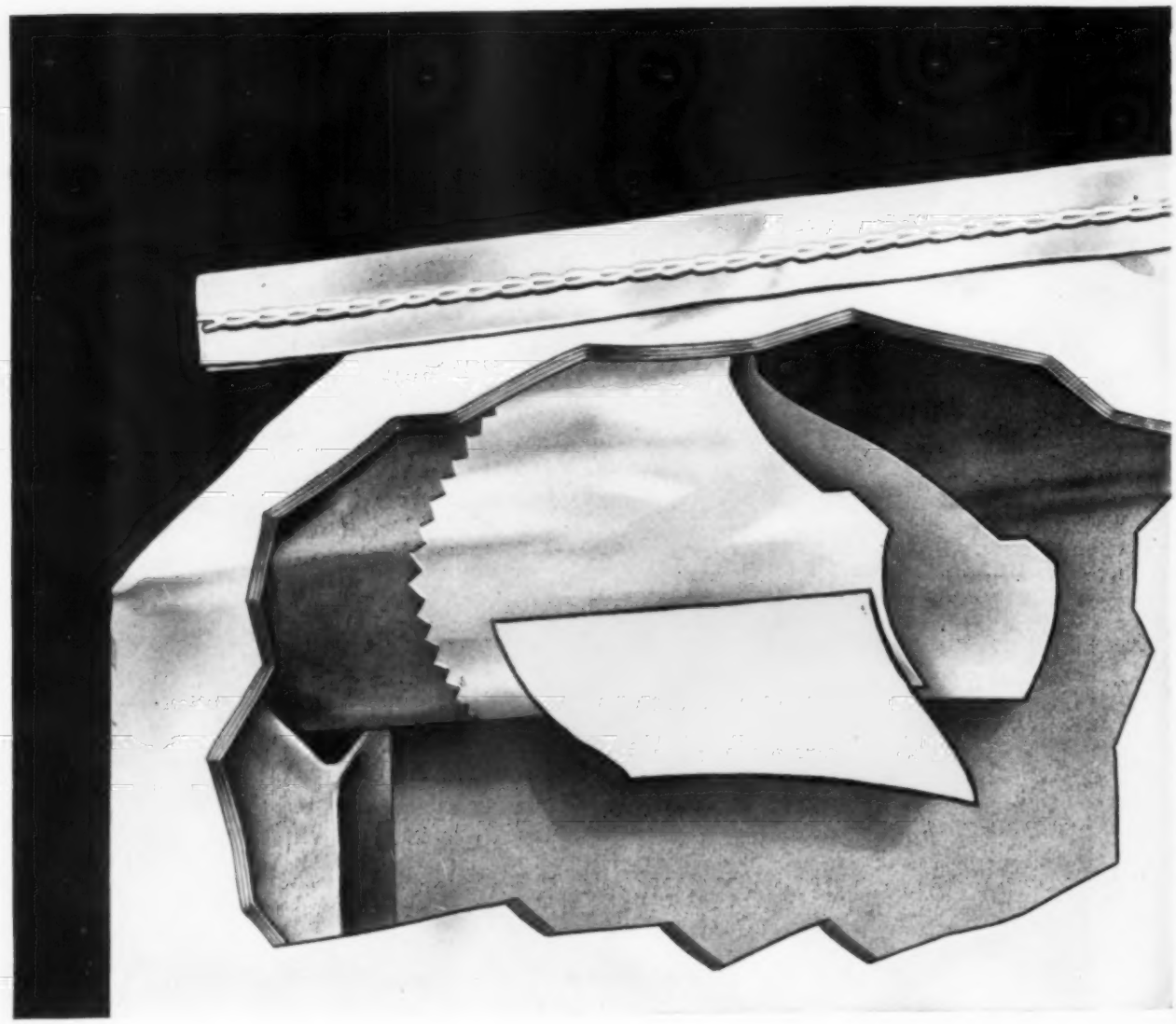

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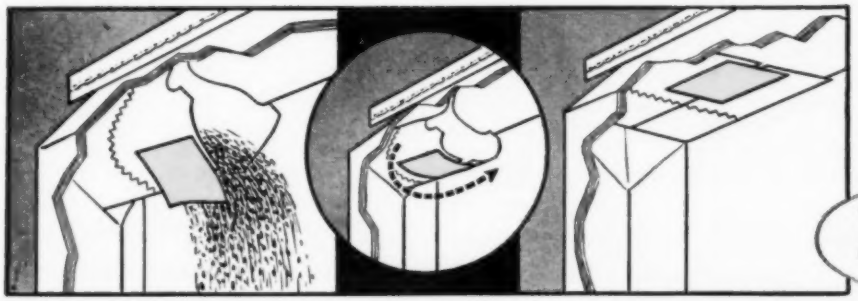

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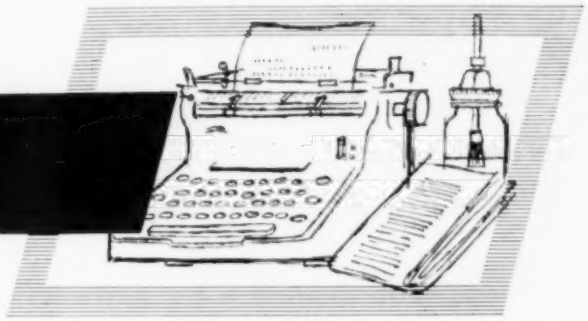
EDITORIALS



NORMALLY leaders of an industry could be expected to look with enthusiasm on a proposal that the government spend a couple million dollars on research for their industry. The insecticide industry, however, evidently views with a rather jaundiced eye the proposal that the Federal government appropriate two and a half million dollars for insecticide studies by the U. S. Fish and Wildlife Service. Perhaps they can be pardoned if they feel that, in such an investigation, the deck would be stacked against them. Certainly many of the supporters of the project seem to be approaching the idea with something less than scientific detachment. We get the feeling that some of them view the proposed program, not so much as a search after scientific truth, but as a strategic preliminary step toward a drastic abbreviation of the use of pesticides.

In their appearance before a Senate committee considering the project, spokesmen for the pesticide industry have made a strong case for a fair and unbiased study, if one is to be made. They have emphasized that the problem of insecticide toxicity to wildlife should not be considered in a vacuum, but must always be related to the important role of pesticidal chemicals in safeguarding the nation's health and protecting its food supply. Possible damage to wildlife that may result from use of a pesticide, they insist, must always be considered in direct relation to the good accomplished through alleviation of a pest menace.

Industry representatives have also demanded that any research program that is to be conducted should logically be coordinated with the work of other government agencies, as well as with the studies of private industry. The Department of Agriculture and the Department of Health, Education and Welfare are very vitally concerned with use of and research into the performance of pesticides. They, as well as the research departments of pesticide producers, have invested millions in pesticide research and have unearthed a great deal of valuable information. There is obviously no sense in duplicating work they have already conducted, nor in ignoring their findings.

Assuming that decision is made to proceed with the proposed program, any attempt to

(*Continued on Page* 68B)

WE are right up against the period of the year when every company in the agricultural chemical business could use an extra vice-president or two exclusively in charge of going to conventions. Over the course of the next month or two we have three agricultural chemicals associations meeting,—the western, the Canadian and the NACA. Add to this the national convention of the Entomological Association, the Fertilizer Round Table, the Carolinas-Virginia Pesticide Formulators Assn., the Control Officials Conference and the annual meeting of the Fertilizer Solutions Assn., to single out just a few of the important meetings that will be held.

Admittedly these meetings take valuable time of hundreds of top executives in the industry, but they offer important benefits to those who attend. They help explain why there is so much progress in every branch of the industry, and why new developments are so rapidly disseminated from one end of the industry to another.

If you have not already done so, it is time right now to get your hotel and transportation arrangements in order for the fall schedule. See page 125 for full list of all the important meetings to be held in the months ahead.

NO NITROGEN GRANULATION

Production of granular no-nitrogen grades of fertilizer was discussed at the TVA pilot-plant demonstrations, June, 1959. This report based on comments by R. D. Young of TVA, at the meeting.

IN the granulation of fertilizer grades that contain nitrogen, the reaction of ammonia with superphosphates or acid plays an important part in providing conditions that are favorable in granulation. This reaction is not available as an aid to granulation of no-nitrogen grades. These grades usually are made by granulating superphosphates or mixtures of superphosphates with potash salts. In early tests at TVA, we sought to granulate the no-nitrogen materials with water or water and steam in the continuous ammoniator drum. The granulation efficiency was fairly good, but the granules were not very strong. A high percentage of moisture was required for granulation, which made the drying step difficult and expensive.

In seeking to overcome these difficulties, we tried the addition of phosphate rock and sulfuric or phosphoric acid in the formulations. This method proved to be quite successful; the granulation efficiency was improved, the granules were stronger, and the moisture content was so low that little or no drying was required. These improvements were attributed to the heat of reaction of phosphate rock and acid, and to the plasticity of the fresh superphosphate produced in the granules. The reaction of the acid and rock was rapid and substantially complete after one week of curing.

Grades that have been produced in this manner are 0-14-14, 0-20-20, and 0-25-25. The phosphate rock, potash, ordinary and/or triple superphosphate, and recycled fines were fed in the usual way from belt feeders to a collecting belt, which discharged into the continuous ammoniator drum. The acid was fed beneath the bed through a drilled pipe distributor containing twenty holes 3/32 inch in diameter; distribution was over about the first half of the length of the drum. When sulfuric acid was used, enough water to dilute it to about 70 per cent H_2SO_4 was fed into a mixing wye on the distributor. It was necessary to use Hastelloy B for the distributor in which the sulfuric acid was diluted. Type 316 stainless steel was satisfactory when phosphoric acid was used. Steam, when used, was fed through a slotted distributor of the type commonly used for nitrogen solutions. The proportion of the P_2O_5 supplied by the rock and acid varied from one-third to all of the phosphate in the formulation. Formulations and other data for typical tests of these grades are given in Table I. Nongranular potash was used in all of the tests.

Production of 0-14-14

This grade has been produced satisfactorily with from one-third to all of the P_2O_5 from phosphate rock. Data are given in Table I for tests with half and with all of the P_2O_5 from rock. Tests were made with each formulation, with and without the use of steam. Operation without steam was considered marginal, because of the low temperature in the drum (140° to 160° F.), which resulted in erratic granulation and increased sticking of the material in the drum and on the discharge chutes. The use of from 50 to 100 pounds of steam per ton of product gave temperatures of 180° to 200°F. in the drum, thus improving control of granulation and over-all operation. It was necessary to use a small amount of heat on the dryer, primarily to condition the granules for screening and crushing of oversize. The burner was regulated to give a dryer discharge product temperature of 140° to 150° F. Limiting the drying temperature was necessary, because drying to a moisture content below about 4 per cent resulted in decreased conversion. About 95 per cent of the P_2O_5 in the rock was converted to an available form after one week of curing, when conditions were properly controlled.

Production of 0-20-20

The 0-20-20 grade was produced with formulations that utilized either sulfuric or phosphoric acid to acidulate rock and promote granulation. This grade ordinarily requires about 13 units of P_2O_5 from triple superphosphate (48% P_2O_5) and 7 units from ordinary superphosphate (20% P_2O_5) in order to make grade. When sulfuric acid was used, best results were obtained when all 7 units of ordinary superphosphate were produced in the drum by the reaction of rock and acid. The 13 units of triple superphosphate were fed as cured nongranular material. This formulation is shown in the first column under the 0-20-20 grade in Table I.

Operation was reasonably good without steam, but was improved considerably by the use of 50 pounds of steam per ton of product. The temperature in the drum was 136° F. without steam, and 162° F. when steam was used. It was necessary to use a small amount of heat on the dryer (dryer product temperature of 150° F.) to allow proper screening when steam was not used. When steam was used, the drying step could be eliminated, and merely cooling the granulator product was satisfactory. Conversion of the P_2O_5 in the raw rock fed to the process was 92 to 98 per cent complete after 7 to 14 days of curing.

The most satisfactory formulation utilizing phosphoric acid for acidulation also is shown in Table I. Best results were obtained when 9 of the 13 units of triple superphosphate needed in this grade were supplied by the reaction of rock and wet-process phosphoric acid. The 7 units of ordinary superphosphate were fed as cured commercial material. No steam was used, and a small amount of water (15 to 35 lb./ton of product) was added to assist in control of granulation. Granulation and over-all operation were surprisingly good despite the low temperature (96° F.) in the drum. The use of steam to provide a higher temperature was not tested with this formulation. A small amount of heat on the dryer (product temperature of 145° to 150° F.) was necessary to allow satisfactory screening and crushing of oversize. Only mild drying was used, because past experience in drying fresh granular triple superphosphate had shown that temperatures above 160° F. result in reversion of a sizable proportion of P_2O_5 to an unavailable form.

Production of 0-25-25

Best results in the production of 0-25-25 were obtained when half of the P_2O_5 was supplied as rock and wet-process phosphoric acid, and the remainder as cured triple superphosphate. When steam was not used, the temperature in the drum was only 90°F. and the material was quite sticky, causing difficulty in the drum, cooler, and screens. The use of 100 to 125 pounds of steam per ton of product increased the temperature in the drum to 190° F. and improved operation. The formulation and data for a test of this grade, with and without steam, are shown in Table I.

TABLE I

Pilot-Plant Formulations and Data for No-Nitrogen Grades Using Phosphate Rock and Acid

Grade	0-14-14				0-20-20		0-25-25	
Formulation, lb./ton of product								
Phosphate rock (32% P_2O_5)	438		888		458	165	235	
Triple superphosphate (48% P_2O_5)	—		—		590	167	545	
Ordinary superphosphate (20% P_2O_5)	720		—		—	700	—	
Sulfuric acid (93% H_2SO_4)	295		590		295	—	—	
Phosphoric acid (53% P_2O_5)	—		—		—	265	355	
Muriate of potash (60% K_2O)	466		466		666	666	835	
Water								
For dilution of sulfuric acid	100		140		75-100	—	—	
For granulation	—		—			15-35	0-15	
Steam	0	100	0	100	0 50	0	0	124
Recycle	400	400	1900	1900	400 400	200	400	400
Temperature, °F.								
Acidulating drum product	140	190	162	205				
Granulator product	126	172	150	188	136 162	96	90	190
Cooler product	—	—	—	—	124 150	84	88	180
Dryer product	145	150	145	145	150 86	78	80	90
Granulation efficiency, % of −6 +20 mesh								
As granulated	62	68	58	62	47 58	77	58	72
After crushing oversize	82	84	—	—	67 82	88	76	86
Product moisture, %	4.1	4.0	3.7	4.2	3.7 4.2	3.1	3.0	4.1
Net conversion of P_2O_5 in rock,[a] %	95	95	94	95	92 98	94	94	92

[a] After 7 to 14 days of curing.

Formulation Used in Production of 0-25-25 Demonstration

Raw material	Analysis	Pounds per ton of product
Phosphate rock	32% P_2O_5	235
Phosphoric acid (wet process)	53% P_2O_5	355
Triple superphosphate	47% P_2O_5	555
Potassium chloride (nongranular)	60% K_2O	835
Steam		125
Recycled fines		400

In the test in which steam was used, granulation was very good; 72 per cent of the product was minus 6 plus 20 mesh before the oversize was crushed. No heat was used in the dryer, and the material screened satisfactorily. The cooled product contained 4.1 per cent moisture. The over-all availability of the P_2O_5 was 97 per cent, and the net conversion of P_2O_5 from rock was 92 per cent after 1 week of curing at room temperature.

Data from a pilot-plant test production of 0-25-25

Moisture, %	
Acidulator product	4.5
Granulator product	4.0
Cooler product	3.2
Screened product	3.0
Temperature, °F.	
Ammoniator product	195
Granulator product	180
Cooler product	95
Screen analysis (Tyler) of cooler product, %	
Oversize (+6 mesh)	28
Onsize (−6 +20 mesh)	58
Undersize (−20 mesh)	14
Onsize recovery after crushing oversize, %	79
Chemical analysis, %	
Total P_2O_5	26.5
Available P_2O_5	25.6
W. S. P_2O_5	24.0
Free acid	0.8
K_2O	25.5
H_2O	3.0

Production of 0-30-30 and 0-40-20

Calcium metaphosphate has been used commercially in dry blends with potassium chloride to produce nongranular high-analysis grades, such as 0-30-30 and 0-40-20. Considerable difficulty has been reported in obtaining uniform analysis because of segregation of these materials. Granulation was considered to be a promising method for minimizing segregation and for obtaining better handling and storage properties. In exploratory tests, the granulation of calcium metaphosphate and potassium chloride with steam and water was not successful. Successful granulation of 0-30-30 and 0-40-20 was obtained by feeding 6 to 8 units of P_2O_5 as phosphoric acid, and neutralizing the acid with pulverized calcined dolomite. The reaction of the acid and dolomite gave additional heat and plasticity, which supplemented steam in promoting granulation. The acid and steam were fed through distributors beneath the bed in the ammoniator drum, and the dolomite was fed with the other solid materials. Granular potash gave much better results than the nongranular material in producing these grades. Data for tests of the production of 0-30-30 and 0-40-20 are shown in the tabulation below.

A steam rate of about 250 pounds per ton of product gave best results for each of the grades. A somewhat lower proportion of phosphoric acid (6 vs. 7.5 units) was satisfactory for the 0-40-20. The temperature of the reacting material in the drum was about 220° F. in each test. The granules were rather plastic and incompletely granulated as discharged from the drum, but became hard and well formed after passing through the dryer. The free acid content of the products was 0.1 per cent or lower, which indicated efficient neutralization of the acid with the dolomite. The granular products were completely free from caking during several days in the storage pile. These tests indicate that these

(*Continued on Page* 137)

Grade	0-30-30	0-40-20
Production rate, tons/hr.	0.98	0.98
Formulation, lb./ton of product		
Calcium metaphosphate (64% P_2O_5	701	1102
Phosphoric acid (78% H_3PO_4)	275	216
Calcined dolomite	83	54
Potassium chloride (61% K_2O)	990	669
Steam	255	255
Recycle	400	400
Temperature, °F.		
Reaction drum product	222	218
Granulator product	151	145
Dryer product	191	196
Screen analysis (Tyler), %		
Granulator product		
Oversize (+6 mesh)	31.7	40.0
Onsize (−6 +20 mesh)	67.5	59.1
Undersize (−20 mesh)	0.8	0.9
Dryer product		
Oversize (+6 mesh)	10.2	32.4
Onsize (−6 +20 mesh)	77.1	58.4
Undersize (−20 mesh)	12.7	9.2
Onsize product after crushing oversize, %	84	82

SPRAY CHARACTERISTICS of CO-RAL

By J. S. Shaplason
Research Department
Chemagro Corporation,
Kansas City, Mo.

CO-Ral, a systemic control for cattle grubs, was approved for use just a little more than one year ago. Since that time several million cattle have been treated, and best estimates indicate a very high degree of success.

Each new scientific development has its characteristic problems in early use. The control of cattle grubs by a sprayed systemic insecticide is a new practice, unfamiliar to the farmer and rancher. The success achieved with Co-Ral in the past season, under these conditions, is indeed a credit to cattlemen. However, even better control must be achieved before plans for eradication of the cattle grub can be considered. To understand how this can be done, one must understand the chemical and how it works.

Co-Ral destroys cattle grubs by systemic action. Simply stated, this means that the chemical moves through the system of the animal and in its travels comes in contact with, and kills, the cattle grub. All this happens automatically in a short period of time, after the chemical comes in contact with the skin. Once in contact with the skin, the chemical is absorbed through the hide and moves into the subcutaneous fat, and then throughout the body. *Poor control results when an insufficient amount of the insecticide reaches the skin.*

There can be three reasons for too little Co-Ral reaching the skin.

1. Not enough chemical in the spray.
2. Too little spray per animal.
3. Inadequate penetration through the hair to the skin.

The first two are simple problems. The correct concentration is 0.5% active material. This is readily obtained by using 4 pounds of Co-Ral 25% Wettable Powder (it is sold only in 4 pound packages) in 25 U.S. gallons of water. The second problem source is corrected simply by applying an excess of spray, until experience teaches the operator how much he can cut down on each animal and still obtain control. A knowledge of the problems involved in situation No. 3 is an aid to recognizing when enough spray has been applied.

Investigations of inadequate penetration of the hair while spraying indicated that unless the spray strikes the animal with sufficient force, the hair will change from its normal position and become oriented to conform to the direction of the spray, providing an overlapped "shingle" effect deflecting any chemical which is applied. This action is illustrated in succesive Figures 1a, 1b, and 1c.

High pressure sprays, when properly applied, are able to force the hairs apart, permitting the chemical to contact the skin. *The impact of a spray capable of parting the hair is the final result of many components properly combined.* To understand the components of successful sprays, a mechanical device was constructed to measure spray impact. This device is described in Figure 2. A Root-Lowell sprayer was used to provide various spray pressures.

The effect of various pump pressures is shown in Figure 3. Impact on the target, which is analogous to the impact of the spray, on an animal, increases greatly with increased pressure. In pump pressure tests reported here, a Bean Spraymaster Gun, Model 785, equipped with a number 7 disc, was used. The only variable was pressure as measured at the pump.

The spray impact in all tests is measured at a series of distances, one to twenty feet from nozzle to target. The impact increases as the distance to the target decreases. And

Figure 1. The action of a light spray with too little impact is to turn the hair, which in turn will deflect the spray, preventing penetration of the chemical to the skin. Drawings a, b, c from left to right.

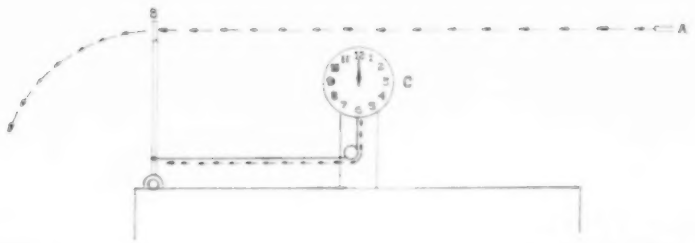


Figure 2. The spray stream from nozzle (A) strikes target (B) and the force of the impact is measured on scale (C) in pounds for leverage obtained through the position of the scale connection.

similarly, in spraying cattle with Co-Ral, penetration to the skin is increased as the nozzle is brought closer to the animal.

The spray nozzle has an effect on the impact of sprays. In Figure 1, five nozzles deliver the same volume of spray. The pressure is kept constant and the same gun is used—only the tips are changed. Great differences are apparent. A thin pencil stream (A) has good impact at close range and sustains a relatively high impact over a long distance. This type of pencil stream is the most effective type of nozzle pattern for spraying animals unrestrained in a pen or corral.

Fan type nozzles have the highest impact at close range with a sharp reduction in impact as the nozzle is moved away from the target. Nozzles B, C, D, and E in Figure 1 are identical except for the angle of the fan. The narrowest fan has the highest sustained impact; whereas, the widest fan drops off most rapidly as distance is increased. Fan nozzles which have a narrow spray pattern of 15° or less can be used effectively when held not more than five or six feet from the animal. Fan nozzles having a fan angle of more than 15° should be held within eighteen inches of the animal. Nozzles with fan angles greater than 50° should be avoided in spraying Co-Ral. Cone nozzles, due to internal friction, provide less impact than the fan type and are less desirable. The effect of the angle of the cone pattern is even more pronounced than the fan pattern.

While nozzles providing different spray patterns have a profound effect on impact, the gun used also has an effect (Figure 5). Bean Spraymaster Gun, Model 785 (A), was used with a number 10 disc at 250 psi. Spraying System Company Gunjet, Model 42 L (D), was used with the identical tip size and pressure. There is a substantial difference in impact between the two types of guns. Two spray guns from the John Bean Division, Food Machinery and Chemical Corporation, were compared. The Bean Spraymaster Gun Model 785 (B), was compared to the Bean "Spraymiser" (E). Both were operated with a number 7 disc and at 400 psi. Again, large differences were apparent. When these two guns were compared at 250 psi., similar, but smaller, differences were recorded.

Finally, gun, nozzle, pressure, and distance from gun to target were maintained constants. Only the angle of impact was changed. As the angle of impact decreased from 90° to near parallel to the target, the amount of impact decreased in mathematical proportion.

Sprays directed at animals should strike the animal squarely. There is always a part of the ani-

(*Continued on Page* 133)

FIGURE 3

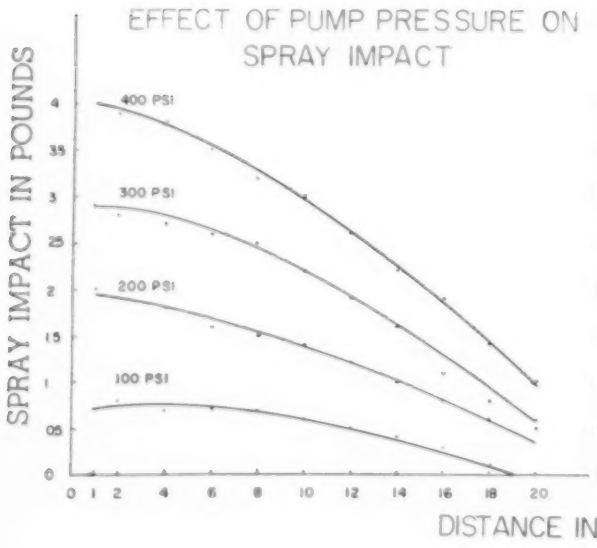
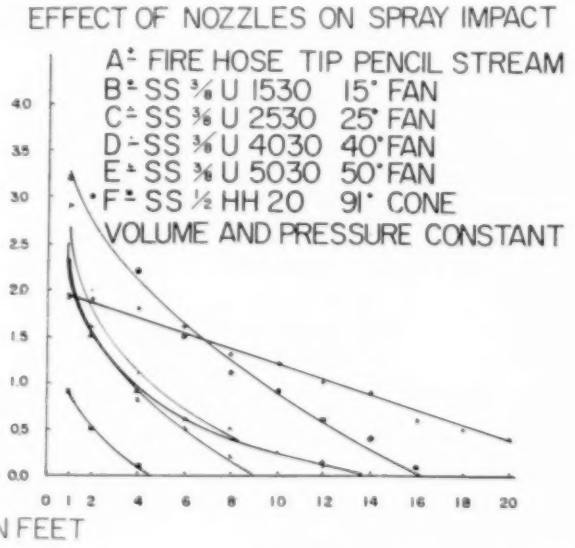
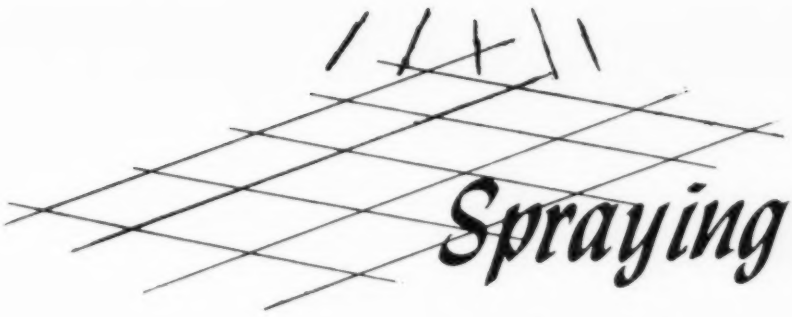


FIGURE 4





Spraying Phosphoric Acid on Top of Bed

Among the discussion at the 1958 Fertilizer Industry Round Table, was the following, concerning experiences in spraying phosphoric acid on top of the bed in an ammoniator. This discussion was presented by T. E. Martin of U. S. Industrial Chemicals Co., Champaign, Ill. The Round Table meeting was held in Washington, D. C.

SEVERAL fertilizer manufacturers are spraying or dribbling phosphoric acid on top of the rolling bed in a TVA ammoniator. The advantage gained by introducing the acid this way is that one sparger pipe less is required in the bed, and the fewer such pipes, the less the interference with proper rolling and lifting action.

There are a number of possible disadvantages to top feed of phosphoric acid in addition to possible greater fume evolution. One is the possibility of splashing, creating an accident hazard or corrosion hazard. This can be eliminated by applying the acid close to the bed, and under only enough pressure for adequate distribution.

A second possible disadvantage is this: Acid applied on top of the bed rolls down to the bottom of the bed quickly, and is then carried up the shell. Reaction of the acid with ammonia tends to be delayed and the average temperature and liquid phase percentage are somewhat different. Increased shell corrosion might be expected, but practically this does not seem to be serious. Additional time is required to fully answer the corrosion question. Another and more serious consequence of the roll-down and carry-up of the acid along the shell of the mixer occurs when large quantities of acid are used per ton of mixed goods. In such a case, this method of application offers the greatest chance for sufficient wetting of the shell so that sliding of the bed occurs instead of carry-up, such as is necessary for mixer operation.

As we know, it is important to the action of a TVA mixer that the liquid phase should be discontinuous. As soon as the surface tension of the liquids present forms a sheet of liquid, so that the gaseous phase is no longer continuous, the mixer operation is in trouble. I have been concerned about the possibility that this is more likely to occur with top feed of the acid than with subsurface feed. I have been unable to confirm this theory with experimental evidence.

The eventual distribution of the phosphoric acid or its reaction products throughout the mixed goods product seems to be about the same for top application of acid as for subsurface introduction of this material.

Question: What is the maximum practical ammoniation rate using anhydrous ammonia and the several phosphate materials?

Answer: The following ammoniation rates are practical and are widely used:

Triple — 4#/unit APA
20% Super — 6#/unit APA
Phosphoric acid — 7#/unit APA

These are not maximum rates, in that these rates can usually be attained without appreciable loss of ammonia, provided the ammonia is fed subsurface in suitable mixing equipment. They may be regarded as maximum practical rates, at least at present. The rate for phosphoric acid can be run up to 7½#/unit APA with reasonably careful operation, without appreciable ammonia loss.

Of course, the attainment of maximum ammoniation rate is a kinetic problem, and it is known that much higher rates than the above can be attained if sufficient time for attainment of equilibrium is allowed. Practically, there is a definite limit on the reaction time (or mixer holdup tonnage) allowable. The design, state of maintenance, and operation of the mixing equipment have a very important effect on the reaction kinetics. The physical condition (porosity, state of fineness, moisture content) of the solid phosphatic materials is of great importance. It is well known that higher temperatures increase reaction rates and therefore the amount of ammonia absorbed.

It is believed that the maximum practical ammoniation rates will gradually be increased as materials, equipment, and operation are improved.

Hazards in Handling F-P Mixtures, Safe Use of Liquid Materials Among Discussions at Chicago Safety School

By H. H. Slawson

WOULD you know what *not* to do during a dynamiting operation in a fertilizer mill? Or what to tell a tractor mechanic *not* to do in making repairs? Or how best to handle slippery floors? Or how management can make a supervisor understand that he is the indispensable link between the top brass and labor?

Questions like these and scores of others comprised the subject matter of discussions at the second of this year's regional fertilizer safety schools held in Chicago, Aug. 18 and 19. Sessions were held at headquarters of the National Safety Council, who co-sponsored with the National Plant Food Institute, the two-day training course for plant personnel responsible for accident prevention in fertilizer manufacturing facilities.

Wm. C. Creel, Raleigh, N. C., national chairman of the school project for the Safety Council's fertilizer section, explained, in opening the Chicago school, that its one objective is "to have a planned safety program in every fertilizer factory." Through the training of supervisors, he said, it is hoped that the accident prevention movement can be passed on from management to employees.

There is still a long way to go, however, said John E. Smith of Spencer Chemical Co., Pittsburgh, Kans., and director of the Chicago school. Last year the fertilizer industry had 9.7 disabling injuries for every million man hours worked, while the frequency rate for the chemical industry as a whole was only 3.6. Obviously there's a big job to be done in reduction of fertilizer plant accidents, he declared.

Dynamiting and what not to do came in for attention when Richard Reed of Illinois Farm Supply Co., was reviewing his organization's experiences in dealing with materials handling hazards at their E. St. Louis, Ill., fertilizer plant. The man directing one certain job had let his helper go elsewhere, just before he touched off the charge. In the blast he was buried to his neck and there he stayed alone a long time before being rescued, and in consequence he was off the job eight months. Farm Supply's Rule No. 1, thereafter has been "Never handle dynamiting without a helper."

This experience, which occurred Oct. 8, 1956, had other results also. Accident prevention acquired new meaning at the plant and for the next 951 days, a total of 281,850 man-hours was worked without a disabling accident. How was this record accomplished? — by attention to the hazards attendant on operation of loaders, hand carts, elevators, conveyors, tractor shovels, small tools, fork trucks and other equipment, and anhydrous ammonia.

One of the "secret weapons" against accidents, long promoted by the National Safety Council, has been a simple scheme aimed to encourage the rank and file worker to take part in a safety program. As School Director John E. Smith, said, "If he commits himself publicly in a discussion he will stand by his principles."

Glenn Griffin, the Safety Council's "old pro", put the idea this way: "Talk with the men about the plant program and get them to talk about it, too."

In the formal program, authorities discussing specific topics included: Mr. Reed of Illinois Farm Supply Co., Lloyd Stitt, Velsicol Chemical Corp., and L. L. Lortschner, Spencer Chemical Co. Z. H. Beers and George Barkley of the NPFI regional office in Chicago were on hand as representatives of this organization.

Roy Benson, manager of industrial sections for the National Safety Council, reviewed the "Fundamentals of Accident Prevention." While accidents "happen," Mr. Benson remarked, safety is achieved only by conscious effort. Unsafe acts and unsafe conditions contribute to 80 per cent of all accidents, and most of the rest are due to human failure." Usually correcting an unsafe condition is the best and the easiest remedy.

Safety is a management job, Mr. Benson declared, and management must have a conscious policy about safety. Continuing, he discussed safety as an operating problem which includes the teaching of safe work methods, development and maintenance of interest and enthusiasm, provision for medical care, the keeping of records and other details.

Since accidents are costly, prevention of accidents is profitable, he declared. Safety activities increase efficiency and improve worker morale, resulting in a more profitable operation.

People work best when they don't have to worry about getting hurt, John E. Smith, school director, said in the first of his talks.

"As a supervisor," he continued, "keeping your people from getting hurt is just as important as meeting your production and quality standards. The foreman or supervisor who goes all out for safety, enjoys the personal satisfaction of knowing that he is helping to prevent suffering and hardship. Workers sense his genuine interest in them and they will tend to co-

operate in making a good safety record."

"Always give workers an answer to any suggestions or recommendations they turn in" Mr. Smith advised. "If the idea is not practical, tell the man why. Always thank him for his thoughtfulness, because maybe next time he'll have a workable idea."

Ed Croushore, NSC staff man, who discussed "Personal Factors in Safety," paid special attention to the part the worker's attitude plays in accidents. An "attitude" he defined as "a belief, feeling or thinking which affects one's reaction to a situation."

Wm. C. Creel, school project chairman and safety director of the North Carolina state department of labor, told his "class" on "Discovering Accident Hazards" that plant inspections are a basic and a most necessary part of a complete safety program, but that accident investigation is equally basic. "Do not try to place blame," he cautioned. "Discovery that someone is at fault is not the place to stop, but the place to start . . . Accidents offer a direct way to detect accident hazards and should be an integral part of a plant safety program."

Mr. Creel's second talk dealt with good housekeeping as a means for promoting safety. In the fertilizer industry, he conceded, good housekeeping is difficult. But it is a very practical means for getting high production, low costs, and improvement in employee morale and public relations.

"Properly organized and supervised," he asserted, "good housekeeping will increase efficiency, and reduce occupational hazards by providing a safer, healthy working environment."

Two technical subjects commanded attention at the final Wednesday afternoon session. Hazards in handling fertilizer - insecticide mixtures were reviewed by Lloyd Stitt, entomologist with Velsicol Chemical Co. "Safe Use of Liquid Materials in a Fertilizer Mixing Program" was the subject of a leng-

(*Continued on Page* 128)

Hon. Everett M. Dirksen to Address NAC at the October 21st Meeting in French Lick

PESTICIDE Sales, Marketing and Promotion will highlight discussions at the 26th annual meeting of the National Agricultural Chemicals Association, to be held Oct. 21-23 at the French Lick-Sheraton Hotel, French Lick, Indiana. As *Agricultural Chemicals* went to press last month, NAC received word that the Hon. Everett McKinley Dirksen (Sen. Illinois), will address NAC members at a luncheon on October 22nd. Other program details are as follows:

Wednesday, October 21: Meeting called to order by Roger Roth, Velsicol Chemical Corp., Chicago, and the Presidential Address by Jack Vernon, Niagara Chemical Div., FMC, New York.

Reports on "Sales and Marketing of Pesticides" by Robert S. Thompson, Thompson - Hayward Chemical Co., Kansas City; "Advertising and Promotion of Pesticides" by L. F. Czufin, California Spray Chemical Corp., Richmond, Calif. Panel review on "Wildlife," with J. Dreessen, NAC, as moderator. Participating in the discussion will be W. W. Dykstra, Fish and Wildlife Service, USDA; Clarence H. Hoffman, USDA; Charles Lincoln, Univ. of Arkansas; and a representative of one of the national wildlife conservation groups.

Thursday, October 23: NAC Committee Meetings.

Friday, October 23: Charles H. Sommer, Monsanto Chemical Co., St. Louis, will preside at the morning sessions, and introduce the newly elected president. NAC staff will report to members on activities in which the Association is participating. NAC committee chairmen will report on current status of projects.

The meeting will conclude with a report by Dr. H. L. Haller, USDA, ARS, on "World Pest Control Developments," and a discussion of "H.R. 6436—How it Affects the Industry," presented by J. A. Noone, NACA, and Justus Ward, USDA.

Relative Toxicity to

A QUESTION frequently asked concerning the use of insecticides and other pesticides is, "How toxic is the chemical to humans?," or "Is this insecticide more dangerous than DDT?" The standards in common use to compare toxicities are based on tests with various small animals. White rats generally are used to get comparisons on the lethal amounts via ingestion and rabbits for the amounts by way of skin absorption. The amounts are usually given as an LD_{50}. This means the size of the dose which is lethal to 50 percent of the test animals.

The LD_{50} is usually expressed in terms of milligrams (mg.) of toxicant per kilogram (kg.) of body weight of the test animal. One milligram (mg.) is equal to .000035 ounce and one kilogram (kg.) is equivalent to 2.2 pounds. Using DDT, for example, the amount which needs to be ingested in a single dose to cause death to 50 per cent of the test rats is approximately 250 milligrams of technical DDT per kilogram of body weight of the rats. Thus, we say that the acute oral LD_{50} of DDT to rats is 250 mg./kg. Likewise, the acute oral LD_{50} of parathion to rats is about 3 mg./kg., while that of malathion is approximately 1500 mg./kg.

From this we see that parathion is considerably more toxic to rats than is DDT or malathion. It does not necessarily follow, however, that parathion is 83 times as hazardous to use as DDT or 500 times as hazardous to use as malathion. The spray or dust concentration of parathion generally used for insect control is considerably lower than that of DDT or malathion. Also, parathion residues break down much more quickly than those of DDT, chlordane, dieldrin, and many others. In addition, the figures given here are for rats, and not all animals react the same as rats.

The acute dermal toxicity figures are usually higher than oral toxicity ones. It usually takes much more insecticide put on the skin to cause death than it takes to kill by ingesting the insecticide.

It is important to realize that the figures given are approximate ones. The LD_{50} which researchers determine may vary rather widely, depending on how the tests are conducted. The variances among the test data may result from differences in the reactions of the test animals due to: (1) sex of the animals, (2) age of the animals, (3) type of carrier for insecticide (corn

Note: Numbers in parenthesis identify references listed at end of article.

Pesticide		Acute LD_{50} (mg./kg.)	Male	Female
TEPP	Rats—Oral	2 (30)	2.0	1.2 (31)
	Rabbits	48 fatal (30)		
Parathion	Rats—Oral	3 (2)	13.0	3.6 (31)
	Rabbits—Derm.	40-50 (2)		
	Rats—Derm.		21.0	10.9 (31)
Thimet	Rats—Oral	3.7 (29)		
	Guinea Pigs—Derm.	415 (29)		
Systox	Rats—Oral	9 (28)	6.2	2.5 (31)
	Rats—Derm.		14.0	8.2 (31)
Methyl Parathion	Rats—Oral	15.2 (2)		
Guthion	Rats—Oral	15-25 (27)		
	Rabbits—Derm.	250 gave no symptoms (27)		
Endrin	Rats—Oral		17.8	7.5
	Rats—Oral		28.8	16.8 (3)
	Rats—Derm.			15 (3)
Trithion	Rats—Oral		30 (26)	
	Rabbits—Dermal	1270 (26)		
EPN	Rabbits—Dermal		35-45	9-15 (25)
			LD_{100} 50	150
Aldrin	Rats—Oral	40 (2)	54.2	56.0 (3)
			59.6	52.3 (3)
			31.6	23.7 (3)
			49	38 (35)
	Rabbits—Derm.	—	140.0 (3)	
Nicotine		50-60 (2)		
Dieldrin	Rats—Oral	87 (2)	46	46 (3)
			90	60
	Rats—Derm.		80	(3)
			60	45
	Rats—Oral	40-50 (32)		
		45-50 (36)		
Toxaphene	Rats—Oral	69 (2)		
		90 (2)		
		60 (2)		
	Rats—Oral	40 (In peanut oil)		
		120 (in kerosene)		
		120 (in corn oil)		
	Rabbits—Derm.	Less than 250 (using 20% sol.)		
		Less than 1000-2000 (40% dust)		
		More than 1000 (5% dust)		
Lethane 384	Rats—Oral	90 (2)		
Heptachlor	Rats—Oral	90 (2)	90	130 (3)
			105	132 (23)
Kepone	Rats—Oral		95 (22)	
	Rabbits—Derm.		435 ± 11 (22)	
Ethion-Tech	Rats—Oral		96 (86-107) (21)	
Purified	Rats—Oral		208 (128-134) (21)	
Lead Arsenate	Rats—Oral	100 (2)		

Mammals of 40 Pesticides

*by S. H. Kerr and J. E. Brogdon**

Agricultural Experiment Station Agricultural Extension Service
Gainesville, Florida

oil, peanut oil, kerosene, etc.), (4) forms of insecticide (technical, purified, emulsifiable concentrate, wettable powder, etc.). These and other factors are not constant among the various research laboratories, and thus, two laboratories working with the same chemical and test animals may get substantially different LD_{50}'s depending on their test method.

It cannot be assumed that the figures given in the charts accompanying are also the LD_{50}'s for humans. The LD_{50} for the same chemical will vary considerably with different mammals. Thus, as far as humans are concerned, we can only use the figures as an indication of relative toxicity. For example, most of us are familiar with DDT and know about how dangerous it is to handle this material. From the figures in the table, we can state that methoxychlor is evidently much safer than DDT, Thimet, Systox, and parathion obviously are much more toxic than DDT.

The figures given here were compiled from the references listed. None of the data are original with the authors of this paper.

Pesticide		Acute LD_{50} (mg/kg) Male	Female
Thiodan	Rats—Oral	110 (55-220) (20)	
	Rabbits—Derm.	359 (161-800) (20)	
Diazinon	Rats—Oral	150-220 (19) 108	76 (31)
	Guina Pigs—Dermal	4000*	
	Rats—Derm.	180 (31)	
Lindane	Rats—Oral	125 (2)	
		200 (3)	
	Rabbits—Dermal	180 (3)	
Pyrethrins	Rats—Oral	200 (2)	
DDT	Rats—Oral	250 (2) 113	118 (3)
			225
	Rabbits—Dermal		300 (3)
V-C 13	Rats—Oral	270 (18)	
	Rabbits—Dermal	6000 (18)	
Dibrom	Rats—Oral	430 (17)	
	Rats—Dermal	1100 (17)	
Dipterex, Dylox	Rats—Oral	450 (15) 630 (31)	
	Rabbits—Dermal Acute—Lethal	5000 (16)	
Chlordane	Rats—Oral	590 (3)	
	Rats—Oral	335	430 (3)
	Rats—Oral	457	495 (3)
	Rabbits—Dermal	800 (3)	
Lethane 60	Rats—Oral	500 (2)	
Kelthane	Rats—Oral	575 (12)	
Sevin	Rats—Oral	540 (11)	
	Rabbits—Dermal	over 5000 (11)	
Genite 923	Rats—Oral	(10) 1400 ± 420	1870 ± 240
	Rabbits—	180 in 15 applications gave no symptoms	
Malathion	Rats—Oral	1500 (8) 1375	1000 (31)
	Rats—Dermal	4444	4444 (31)
Korlan	Rats—Oral	1700-1740 (9)	
	Rabbits—Dermal	1600-2000 (9)	
Ovotran	Rats—Oral	2050 (1910- 2200) (7)	
Chlorobenzilate	Mice—Oral	1500-3200 (6)	
	Rabbits—Dermal	No symptoms	
TDE, DDD	Rats—Oral	3400 (2)	
Mitox	Rats—Oral	3000 gave no symptoms (5)	
Aramite	Rats—Oral	3900 (4)	
Methoxychlor	Rats—Oral	6000 (2)	
	Rats—Oral	6000 (3)	
Tedion	Rats—Oral	14,700 gave no mortality (1)	
	Rabbits—Derm.	10,000 gave no mortality (1)	

*LD_{50} for 25% E. C. This is not in terms of technical or purified as are other figures in table.

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(*Continued on Page* 135)

*Presented at a meeting, May, 1959 of the S. Florida Pestorama, Miami.

Western Orchardists Report on New Pesticide Materials

mite resistance to Kelthane, a serious development

— A Special Report For Agricultural Chemicals —

APPLE orchardists who have noticed a tendency of Sevin to knock off a few fruits can turn this to an advantage, it was pointed out to fruit growers in Washington state during the annual summer orchard tours sponsored jointly by Washington State College and the state horticultural association.

Remarkably uniform results in thinning Delicious apples were reported when Sevin was applied at the rate of 1½ pounds to 100 gallons of water (insecticidal strength) 17 or 18 days after full bloom. In tests in seven orchards, fruit set was reduced from 59 per 100 fruit spurs to 35, which is slightly more fruit left on the tree than is ordinarily desired in Washington's main fruit-producing districts.

There is no danger of thinning apples with Sevin beyond a certain time after full bloom—believed to be from three weeks to 30 days, according to various speakers. No tests have been conducted in that state on the best concentration to use for thinning results. Winesaps apparently are not affected by the material, and in no case was any harmful effect in the growth rate noted.

Growers who do not wish to thin their Delicious apples can wait until 30 days after fullbloom before applying Sevin, Dr. L. P. Batjer, USDA principal physiologist, told some 200 growers at the annual field day at the Washington State College tree fruit experiment station in Wenatchee.

One of the advantages in use of the insecticide as a fruit thinner for Delicious apples is that it does not produce unsatisfactory "side results" as have been reported from applying Amid to this variety. (among other things, the trees tend to produce "pigmies" which stick tenaciously.)

Orchardists in the area who do not control mites are in danger of losing their trees, Dr. Stanley P. Hoyt, Washington State College assistant entomologist, warned. The mite situation is very serious in some orchards where there was a heavy carry-over from last year. Resistance to Kelthane, which previously has controlled the two-spot complex, apparently has developed.

In laboratory tests, it required 30 times as much Kelthane to kill 50% of a field strain as it did to kill an equal percentage of mites raised in the laboratory.

Tedion is the only material providing commercial control of two-spots, but federal clearance had not been obtained at the time of the meeting, and Dr. Hoyt expressed fear it would not be obtained in time to do orchardists any good this season.

Bayer's 30686 is a "very pretty-looking" material, he added, that does an excellent job in killing mites, but it also damaged fruit and foilage in his tests.

Chorobenzilate, which according to reports from California had provided good control, was only fair in Washington tests.

"There's not much I can recommend at this point," he declared in summary.

Because some of the newer pesticides are no longer providing the protection they once did, growers were advised to return to some of the older practices, such as putting out bait pans to trap codling moths (as an aid in timing sprays for their control).

Rosy apple aphids, once held in sharp control provided serious problems this year in two major districts. American Cyanamid's 12880 (Dimethoate) has provided up to five weeks' control per application in tests. The rosy apple aphid over-winters as an egg, then as an adult causes apple leaves to roll tightly so it is difficult to reach with anything except a systemic. The pest moves from the orchard early in the spring, returning in the fall to lay eggs.

Dimethoate, a systemic, also looks promising against moths, the entomologists reported. It is the first of the pesticides to be carried in a tree's "bloodstream" which has shown promise against the codling moth.

Surfactants can cause trouble for orchardists when they mix several materials in a spray tank, it was pointed out. Most of the pesticides have a surfactant added in the formulation, but some surfactants are ionic, and some are non-ionic, which would interact. Again, if each of several pesticides dumped into the spray tank has its own surfactant, the combination may provide more than needed.

(*Continued on Page* 129)

A PATENT recently acquired by Diamond Alkali Co., Cleveland, with broad application to granular herbicides and methods for their application is currently the subject of widespread interest among herbicide manufacturers and users. The U.S. patent (#2,792,295) was issued May 14, 1957 to Maurice M. Wright, New Plymouth, Taranaki, New Zealand, who claimed a prior application in New Zealand dating back to March 29, 1950. Application for the U.S. patent was filed Mar. 19, 1951. The invention claimed under the patent is a granular hormone-type herbicide suitable for aerial application. The broad claims of the patent also cover the method of applying such a herbicide.

Some firms in the business of manufacturing and applying herbicides have apparently been somewhat startled to learn of the existence of the patent. The first that many of them knew that the patent existed was when they received a communication from Diamond advising that they had acquired the patent by purchase and would be pleased to discuss a possible license arrangement to operate under the patent. Patent attorneys for companies affected are reported currently to be studying the patent closely in an attempt to predict whether it would stand up under court test. There is no indication yet as to what royalty arrangement the holder of the patent may have in mind; nor, at least to date, any record of any action taken against any possible infringer.

The patent points out that in the aerial distribution of herbicides it is extremely important to avoid the hazards of drift of the herbicidal material to susceptible plants and vegetation. Such distribution can be safely made by incorporating the weed-killing ingredient into a granule, with material forming the pellet consisting of substances such as clay, gypsum, lime, chalk, superphosphate or solid fertilizer. A fundamental step in the solution of the problem, Mr. Wright observed in his application, was the discovery that most of the hormone type weedkillers do not lose their efficacy under the temperatures necessary to obtain granulation, provided that the temperatures employed are controlled, having regard to the type weedkiller used. It is indicated that the acids and salts of the chlorinated phenoxyacetic acid group of herbicides are suitable; the more volatile esters proved to be not suitable, as their efficacy was substantially lost by volatilization during the granulation process. Esters could be employed only if they were of sufficiently low volatility not to be driven off during granulation.

Other steps in the solution of the problem included the following:

(*Continued on Page* 129)

U. S. Patent 2,792,295

—covering granular, hormone-type herbicides and their application

The following are the specific claims under the Wright Patent:

1. A solid herbicidal product adapted for aerial distribution consisting of granules comprising a carrier medium having intimately incorporated therein a phytocidal proportion of an organic hormone herbicidal substance, said granular product consisting of granules small enough to pass through a 10 mesh B.S. sieve and free of particles that will pass through an 80 mesh B. S. sieve.

2. A granular product as defined in claim 1, wherein the organic hormone herbicidal substance is a chlorinated aryloxy acetic acid compound.

3. A granular product as defined in claim 1, wherein the organic hormone herbicidal substance is selected from the group consisting of 2,4 dichloro phenoxy acetic acid, 2,4,5 trichloro phenoxy acetic and salts thereof.

4. A granular product as defined in claim 1, wherein the organic hormone herbicidal substance is the sodium salt of 2,4 dichloro phenoxy acetic acid.

5. A granular product as defined in claim 1, wherein the carrier medium is a solid calcareous substance selected from the group consisting of superphosphate, clay, gypsum, lime, chalk and mixtures thereof.

6. A granular product as defined in claim 1, wherein the carrier medium comprises a solid fertilizer substance.

7. A granular product as defined in claim 1, wherein the carrier medium comprises superphosphate.

8. The method of destroying undesirable foliage such as weeds and the like by evenly distributing controlled quantities of a herbicide over controlled ground areas upon which the growing foliage is to be destroyed, comprising intimately incorporating a phytocidal proportion of an organic hormone herbicidal substance into a solid carrier substance, converting the intimate mixture to granules, screening the granules to remove particles larger than 10 mesh and smaller than 80 mesh B. S. sieve size, whereby a dust-free granulate is produced sized to critical aerial deposition size, and then aerially distributing the granules over the specific land area to be treated in quantity sufficient to destroy the undesirable foliage growing thereon.

9. A solid herbicidal product adapted for aerial distribution, said product consisting of granules comprising a carrier medium having intimately incorporated in phytocidal proportion therein a herbicidal substance, said granular product consisting of granules small enough to pass entirely through mesh B. S. sieve and free of particles that will pass through an 80 mesh B. S. sieve.

10. A solid herbicidal product adapted for aerial distribution, said product consisting of granules comprising a fertilizer base as a carrier medium having intimately incorporated therein a phytocidal proportion of a herbicidal substance, said granular product consisting of granules small enough to pass through a 10 mesh B. S. sieve and free of particles that will pass through an 80 mesh B. S. sieve.

11. The method of applying a herbicide comprising distributing a herbicidal substance contained in phytocidal proportion in a carrier base of granules, said granules having a particle size small enough to pass a 10 mesh B. S. sieve and free of particles that will pass an 80 mesh B. S. sieve by scattering the same aerially from aircraft to fall upon the surface area of the land to be treated.

Modern fertilizer manufacturing ranges from a relatively simple to a highly complex chemical process both of which demand a complete and integrated service from basic suppliers. One company, alone, offers —

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There was a time when a man would run a tidy fertilizer business from his roll-top desk. Purchasing, formulating, selling, shipping and bookkeeping added up to a busy . . . but manageable . . . job.

But like most everything else in this world, the fertilizer business has moved ahead. And progress brings problems . . . problems undreamed of just a generation ago. The technical side of the business can be enormously complex. State and federal standards are more exacting. Analyses go higher . . . equipment is more technical and intricate . . . and formulating is more sensitive to the many influences that can upset its fine balance.

It stands to reason that such a thoroughly integrated business can best be served by a supplier who recognizes its present-day complexity — whose interest, understanding and service takes in the *whole picture* rather than just one aspect or another. Because your manufacturing operation cannot be treated as a combination of unrelated activities, any attempt to do so runs the risk of jeopardizing the *whole* process.

That is the very reason IMC consolidated its services to the fertilizer industry. We understand the inseparable nature of modern fertilizer operations and submit that anything less than *total service* is risky service at best. Total service? It is unique to IMC. It

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is the mark of a full-line company. It expresses itself in the sense of responsibility the IMC salesman feels in offering you any service that can contribute to the betterment of your business. It expresses itself through the IMC Technical Service staff — geared to treat *all* phases of your manufacturing operations whether they be concerned with nitrogen, phosphate or potash. It expresses itself through the IMC Transportation Department — ever searching out ways to improve the efficiency and reduce the cost of *all* your incoming and outgoing materials.

Putting it another way, IMC's *total service* is a true reflection of our Full Orbit philosophy. Its spirit pervades every contact you have with the people of IMC. Our every representative — whether he be salesman, technician, transportation expert or even president — has a mission of constructive assistance to perform each time he calls.

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- More on Reader's Digest features on pesticides.

WHEN we hopped on the *Readers' Digest* last month for the article in the June of their publication, "Backfire in the War Against Insects", we must admit that we did not realize that their previous record for dealing fairly with the products of the pesticide industry had been so good. And, while we withdraw not a single shred of our assertion that Mr. Strother's article was biased and unfair to pesticides, we must admit that in previous articles about pesticides the influence of the *Digest* had been decidely for the good. Which incidentally, makes it all the more difficult for us to realize how they could have let such a prejudiced mish mash as the Strother article get into print.

We doubt that the pesticide industry in general realizes how many good, helpful articles the *Digest* has run on pesticide products over the past few years. Certainly, so far as we know, very little has been done by the industry to capitalize on what could have been a million dollar opportunity to get much favorable publicity. These articles could and should have been reprinted by the millions and distributed in a cooperative industry program. So far as we can determine, however, only minimum publicity was given to them by an industry which could very profitably have used a better press over the past few years.

Among the articles that *RD* has run over the past ten years was one in their issue for July, 1950, entitled "Hell on 'Hoppers", condensed from an article which originally appeared in the *Denver Post*. It tells the story of the successful use of chlordane and toxaphene to "stop a grasshopper plague in its tracks." In an earlier year when no controls were used, it was recalled, grasshoppers "not only ate the crops (right down to the roots) but the bushes and foliage as well. There were reports of fence posts being eaten, and of grass-hoppers that entered houses to gobble clothing and curtains and gnaw the paint off furniture."

And as for possible hazard to wild life, the *Digest* stated: "Fears were expressed that the bait would kill game birds and other wild creatures—but after the actual cam-

paign – observers found only dead grasshoppers."

"The Years of the Locust" was the title of an article in the July, 1953 issue of *RD*. It told a dramatic story of the important aid given by American aerial applicators and U.S.D.A. entomologists in a program to protect Iran, Iraq and Jordan against a destructive locust plaque through use of aldrin. Similar locust plagues existed in the United States during the 1870's, it was observed, and were it not for control measures taken, "grasshoppers would almost have ended farming in a half-dozen western states."

The January, 1955, issue of the *Digest* carried an interesting article on "Captan – The Amazing New Fungicide." Each year, it is pointed out, "fungi spoil three billion dollars' worth of our fruits, vegetables and grains in the fields and close to 300 million dollars' worth between harvest and the home dinner table". Through use of such modern chemical tools as Captan, the *Digest* asserted, there is promise now for "better tasting, better looking, longer lasting and more abundant fruits and vegetables – and at lower prices."

The story of "Biological Control vs. Insect Pests" was told in the April, 1957, issue of the *Reader's Digest*. This article reviewed the use of "milky" disease to control Japanese beetles, the extermination of the screwworm on the island of Curacao by use of radiated screwworm flies, use of nematodes to control codling moth and corn earworm, the development of *Bacillus thuringiensis* which has given such effective control of the alfalfa caterpillar, and, one of the most dramatic of all entomological achievements, the introduction of the Vedalia beetle into California citrus orchards to control the cottony cushion scale which was threatening to wipe out this billion dollar industry.

"It's Not Too Late To Save Our Elms" was the title of a story in the August, 1957, *Digest*. "If we abandon our elms to this disease",

(*Continued on Page* 128)

FERTILIZER INDUSTRY ROUND TABLE

to Discuss Practical Problems in Processing Fertilizers

THE annual meeting of the Fertilizer Industry Round Table is expected to attract some 300 fertilizer plant production superintendents and industry representatives. This year's meeting will be held November 4-6 at the Mayflower Hotel, Washington, D.C. Chairman of the group is Vincent Sauchelli, who is one of 18 founders of the Fertilizer Industry Round Table.

A special feature of the 1959 meeting will be a discussion of fertilizer manufacturing techniques and related problems, using some of the older (including batch) methods. Full details of the program are listed below. Hotel reservations should be made directly with the Mayflower.

WEDNESDAY, NOV. 4

INTRODUCTORY REMARKS
Vincent Sauchelli, Chairman

PLANT PROCESSES FROM NEW MATERIALS TO BAGGING
L. V. Clagg and Staff, Canadian Industries, Inc.
A. Henderson, Wilson & Toomer Fertilizer Co.
A. Jackson, Fertilizer Equipment Sales Corp.

MECHANICS OF CALCULATING FORMULATIONS
W. J. Tucker, GLF Analytical Laboratory
J. E. Reynolds, Davison Chemical Div.
H. H. Tucker, Sohio Chemical Co.

MODELS REPLACE BLUEPRINTS
W. C. Weber, Dorr-Oliver, Inc.

THURSDAY NOV. 5

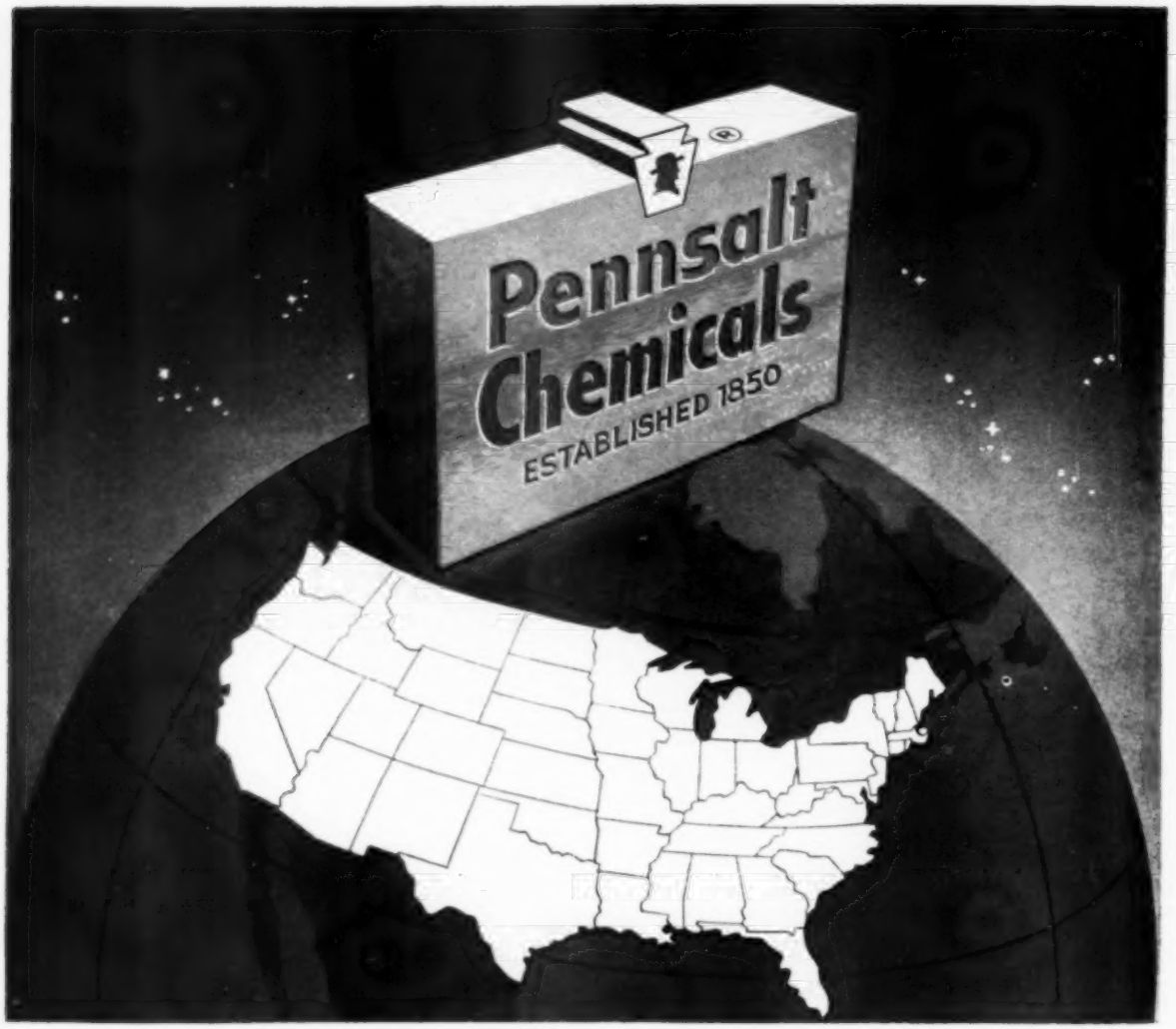
PROBLEMS OF CONVENTIONAL FERTILIZER MANUFACTURE
1. Mechanical Condition
a) Use of Urea Nitrate Solutions
J. O. Hardesty, USDA
H. H. Tucker, Sohio Chemical Co.
G. R. Gilliam, Allied Chemical Corp
b) Use of UAL Solutions
2. Segregation
a) Particle Size of Raw Materials
W. L. Hill, USDA
b) Mixing, Rotary and Gravity Mixers
H. B. Kruger, Stedman Foundry & Machine Co
W. Sackett, A. J. Sackett & Sons Co
R. E. Robinson, Atlanta Utility Works

SEMI GRANULAR MIXTURES
1. *Rotary Mixers*
Enos Valliant, Dorchester Fertilizer Co.
2. *Eymann Process*
G. Walton, Tennessee Corp.
3. *Blocke Sparger*
J. C. Sharp, Spencer Chemical Co
L. D. George, Richmond Guano Co.

STATISTICAL QUALITY CONTROL
Chester H. McCall, Booz-Allen Research
Vance Ward, Canadian Industries, Ltd.

FRIDAY NOV. 6

PRE NEUTRALIZATION - PANEL DISCUSSION
G. R. William, Allied Chemical Corp.
Grant Marburger, Spencer Chemical Co.
Philp E. Stone, Virginia-Carolina Chemical Corp.
Frank G. Keenen, E. I. duPont de Nemours & Co
N. K. Alfrey, Davison Chemical Division.



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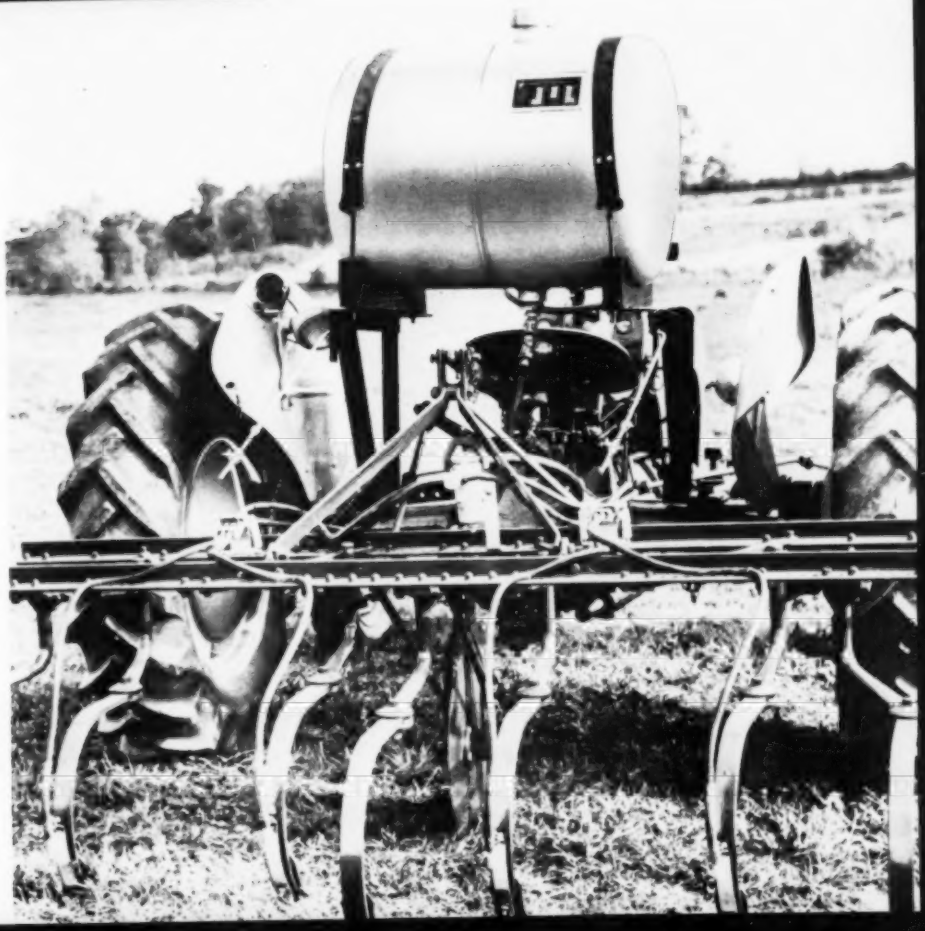

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Hopper load restriction	1200 lbs.

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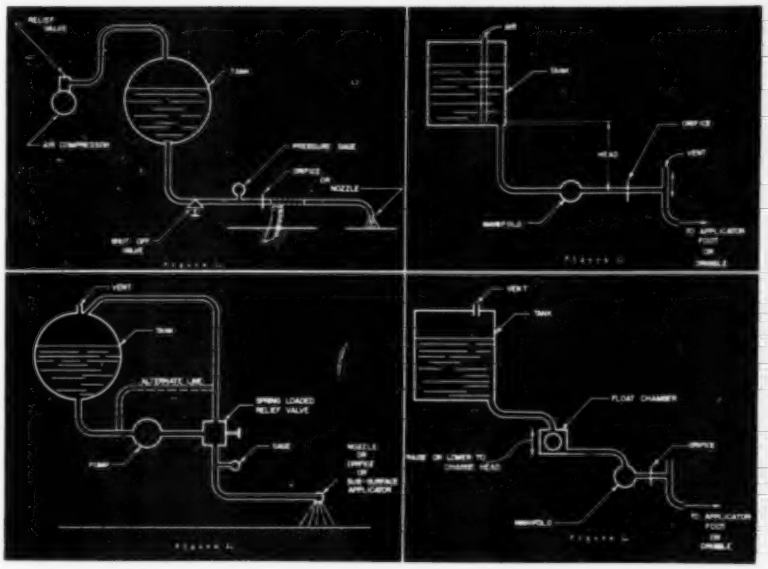

Fig. 1. (top left) Pneumatic system uses an air compressor powered by small engine or power take off of tractor. Fig. 2. (bottom left) The hydraulic system that long has been used to apply chemicals.

Fig. 3. (top right) A gravity flow system that introduces the air at the bottom of the tank. Fig. 4. (bottom right) A float valve is substituted for the closed chamber in this gravity flow system.

Handling and Applying Complete Liquid Fertilizers

by C. M. Hansen

Professor of Agricultural Engineering
Michigan State University

THE methods used to handle liquid fertilizers are dependent upon the corrosive effects, viscosity, and vapor pressure of the chemicals that are included in each formulation. The fertilizers which now are in common use on the farm can be listed in three categories with respect to vapor pressure. They are: high vapor pressure, low vapor pressure and non-pressure.

The fertilizer which is listed as a high vapor pressure chemical is anhydrous ammonia, which exerts 197 psi at 100°F. This chemical should be handled in vessels which will withstand a working pressure of 250 psi. This article, however, is limited to the factors involved in handling complete liquid fertilizers, and does not go into the handling and metering of anhydrous ammonia.

The vapor pressure obtained by a low pressure solution is derived from the anhydrous ammonia used to compound the solution. Aqua-ammonia containing 22 per cent nitrogen will have no vapor pressure at 89°F, but the vapor pressure increases with the increase in temperature. Aqua-ammonia has been used to a large extent in California, but an inspection of the fertilizer plants last summer indicated that this form of nitrogen is on the wane.

Centrifugal pumps have been used to transfer the aqua-ammonia from storage tanks to nurse tanks and then to the applicator tanks through 2½ to 3 inch diameter lines to minimize down time. Aluminum, steel, stainless steel, and a number of plastics can be used to handle this material.

The non-pressure liquid fertilizers consist primarily of urea, ammonium nitrate, ammonium sulfate, and the complete fertilizers.

One of the factors to be considered in handling the complete liquid fertilizers is the "salting out" property of the chemical. Liquid fertilizers will "salt out" when the temperature drops below a critical point for that chemical. Two techniques have been used to minimize this problem. One is to apply the chemical while it still is warm from the chemical reaction of compounding it, and the other is to agitate the material continuously to keep in suspension the salts which separate.

Applying Liquid Fertilizers

The biggest single problem in handling all liquid fertilizers evolves around the accurate metering of it into the soil. There are several variables which must be considered. They are: width of applicator, speed of applicator, nozzle spacing, size of orifice, and the head of the chemical at the orifice or nozzle. The systems used for metering liquid fertilizers might be classified in four categories; pneumatic, hydraulic, gravity flow, and ground wheel devices. The speed of travel of the applicator is a factor with the first three systems.

The head on the liquid in a pneumatic system is maintained by an air compressor pumping into an air-tight vessel containing the fertilizer. A relief or "pop valve" is used to maintain a constant head throughout the application period. (figure 1). Adequate size lines of equal length to the applicator feet, spray nozzles, or dribble outlets will assure uniform application of the chemical.

The hydraulic system used to meter fertilizer is familiar to the farmer, for he has used it in spraying herbicides and other pesticides. It involves the use of a piston,

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gear, or roller impeller pump to maintain a constant head on the chemical. (figure 2).

A disadvantage of this system is that the pump must be designed to withstand the corrosive and deteriorating effects of the chemical. Usually the orifice plates are mounted in a manifold and the fertilizer is fed to the outlets by hoses. Nozzles are used in place of the orifice plates in the event that the chemical is to be sprayed.

The gravity flow system is the most inexpensive and can perform satisfactorily on farmer-owned equipment. A disadvantage to the commercial applicator in this system is that it usually limits the speed of application.

Taking advantage of the head caused by the fall of the chemical from the tank to the soil, one gravity flow system employs uniform hose lengths to the applicator feet. The orifices are placed at the lowest point in the applicator foot. The designers of this piece of equipment contend that the difference in head caused by the falling liquid level in the tank is not large enough to cause wide variations in application rates. It is necessary that a constant speed of the applicator be maintained. A more constant head can be obtained by sealing the tanks and introducing the air at the bottom of the liquid. An application rate can be altered by changing the speed of the applicator or by changing the orifice size.

A refinement of this principle can be had by feeding the chemical into the bottom of a manifold. The manifold is fitted with orifice plates which feed the outlets. The outlet lines are vented near the manifold to stop siphoning of the lines leading to the applicator feet or outlet. It is imperative that these lines have a continuous fall and be of sufficient size to maintain an air space above the flowing liquid. The difference in elevation between the point at which the air is induced in the tank and the vent next to the manifold is the actual head of the chemical. (figure 3). This head can readily be varied.

Capillary copper tubes of varying length and size can be substituted for the orifice plates. A chief advantage of the capillary tube over the orifice plate is that a larger opening is possible.

A float system might be incorporated in the line above the manifold to eliminate the need for a sealed tank. The difference between the level of the liquid in the float chamber and the vent next to the manifold is actual head. (figure 4).

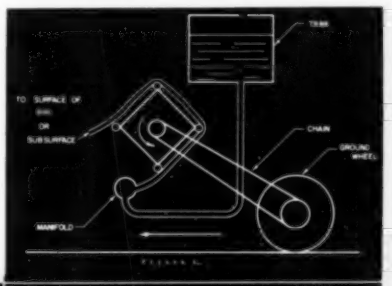
The ground wheel principle of metering eliminates one of the variables; namely, the speed of the application equipment. There are three ground-wheel-driven pumps which have been employed to meter liquid fertilizer. They are the piston, hose, and gear pumps. The number of strokes of the piston pump can be varied with respect to machine travel as well as the length of the stroke. (figure 5). The hose pump employs an old laboratory principle of stretching a hose over a reel. (figure 6). As the reel turns, the bars squeeze the hose and force a given quantity of liquid out of the hose. A refinement of the hose pump employs a semi-circular enclosure which makes it possible to reduce tension on the hoses. This metering device can supply the chemical to the applicator shank or dribble outlet on the surface of the soil. Most fertilizers will not react on many of the new plastics, and, for this reason, the hose pump is a very successful system for metering liquid fertilizers. The ground-driven gear pump operates most satisfactorily against a very low head. The liquid coming up from the tank is lifted by the pump into a manifold designed much the same as the one used for the gravity flow system. (figure 7).

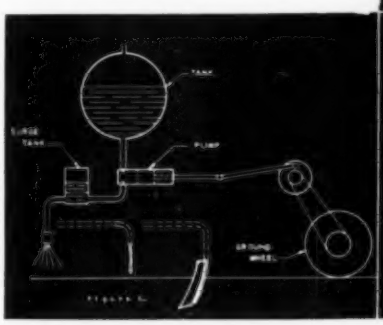
Application Factors

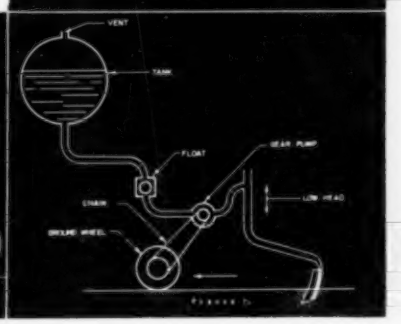
Complete liquid fertilizers can be handled with any of the four metering systems. Solutions containing free ammonia must be applied below the soil surface. Tests indicate that losses can be as high as 1.7 per cent of the total nitrogen applied when the ammonia-compounded nitrogen is released at a depth of two inches below the soil surface. Nitrogen solutions containing free ammonia should be applied deeper than two inches. It might be agronomically advisable to spray urea on stover and crop residue for more rapid decomposition. It has been shown, however, that the fertilizer phosphorus

(*Continued on Page* 131)

Fig. 5. (below) The ground wheel-driven piston pump will accurately meter liquids with varying ground speeds. Fig. 6. (top right) The hose pump will handle any chemical that will not attack the hoses. Fig. 7. (bottom right) The gear pump driven by a ground wheel raises the fertilizer into a manifold with lines leading to outlets.







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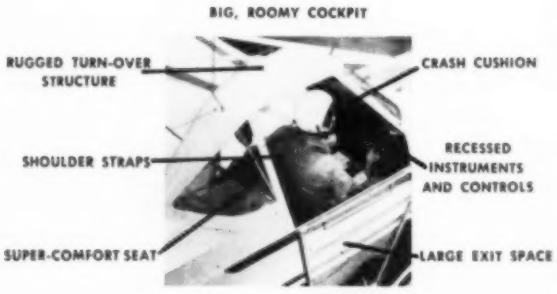

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Aerial Treatment Of Cranberries

AT least 80 per cent of Massachusetts cranberry bog acreage is treated by either helicopter or straight wing plane. The helicopter has been in use over cranberries since 1947, beginning with a dust program, and now is used also in low gallon spraying and fertilizing.

Prior to the appearance on the scene of the helicopter, insecticides and fungicides were applied through high pressure sprayers by running hose out on the bogs. When dusts became available, the motorcycle type of duster was used rather extensively. The most recent ground applicating equipment is a low gallon sprayer, mounted either on small tractor-type or motorcycle-type units.

Raymond F. Morse, a farm supply dealer of West Wareham, Mass., said recently that, although the helicoptor has not had any effect on the amount of acreage devoted to cranberries, it has enabled growers to gain better control of insects through more efficient operations.

In all, there are about 1,200 cranberry growers in Massachusetts, and 75 per cent of them are located in Plymouth County. The state produces nearly half of all the cranberries grown in the United States each year. The average cranberry bog is quite small and usually very irregular in shape so that the helicopter is a natural answer for aerial application, although some small planes are used.

Wiggins Airways of Norwood, Mass., was one of the first applicating concerns to treat cranberry bogs from the air. They started treating cranberries by helicopter in 1947 and now operate four Bell model 47G helicopters. Since cranberry work is concentrated in the months of June, July, and the early part of August, other uses must be found for the helicopters to round out the season. When not busy with cranberry activities, therefore, the Wiggins helicopters can be found all over New England, engaged in spraying orchards, treating forests for pine release, killing brush for utilities, patrolling power lines, and many other activities. E. W. Wiggins Jr., vice president of Wiggins Airways, estimated recently that because of the growth in their other fields of applications, only about, one fourth of the company's helicopter business now comes from cranberries.

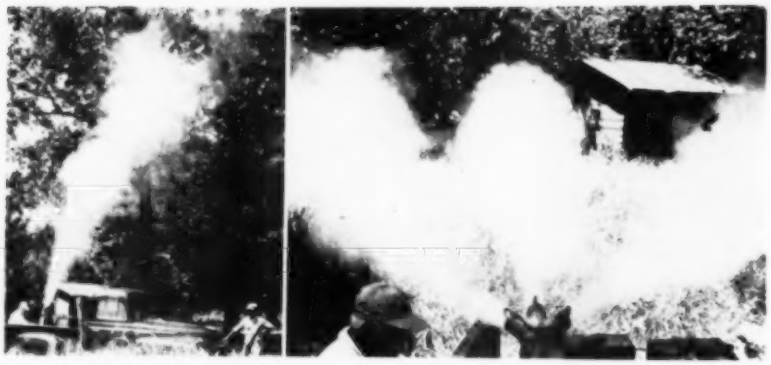
Mr. Wiggins, in describing his cranberry operations, said that one helicopter, on a day with favorable weather, can treat between 250 and 350 acres of cranberry bogs, depending, of course, on the average size and the ferry distance between bogs. There are a total of about 13,400 acres of cranberry bogs in Massachusetts and about half of them are owned by individuals who have five acres or less. The preference among growers for insecticide dusts or sprays has varied through the years, according to Mr. Wiggins who said, however, there has been a definite shift toward liquid materials recently.

In the treatment of cranberries, the timing of applications is very critical. When a new insect infestation is fairly widespread, which often is the case, the demand for helicopter service hits peak periods. Add to this situation a protracted spell of wet weather or high winds, Mr. Wiggins explained, and the helicopter schedule gets "pretty full" for short periods.

Because weather is so unpredictable in the area, helicopter pilots report to the airport and are given their flight schedule each morning at 4:15. The schedule contains all necessary information for the morning's work. Dusting must be done before 10 a.m. because the daytime breezes move the dust too much before it settles among the plants.

Exact scheduling is important for dusting because the supply trucks must be at the site with the needed dusts when the helicopter lands, usually on a dike surrounding the bogs. Because every minute is precious, the load-

(*Continued on page* 133)



Potts Mist Blower Applies Concentrated Pesticides

A new mist blower offered by the Potts Feed Mill & Gin Co., Crawford, Miss., applies herbicides, insecticides, and other pesticides in finely atomized, highly concentrated form. The machine is a compact unit which includes gasoline motor, fan, housing, pump, pressure gauge, and a 25-gallon tank.

Three types of outlets are available for the mist blower. A single round outlet can be used for treating brush and trees up to 55 feet in height (left) and a triple-hole spreader outlet can be used for row crops and for growth up to 25 feet in height (right). A single round outlet is available with drop size and drift control features.

Besides forests and row crops, the machine can be used for spraying pastures, fruit, cotton, corn, nurseries, and for fly and mosquito control. It can be mounted on a pick up truck, four-wheel drive power wagon, jeep, regular tractor, or crawler-type tractor.

Hiller 12E Booklet

The advantages of spraying, dusting, and fogging by helicopter are outlined in a booklet prepared by the Hiller Aircraft Corp., Palo Alto, Calif. The booklet contains pictures of Hiller's 12 E helicopter at work in the field and lists performance specifications.

Copies are available from the company at 1350 Willow Road, Palo Alto.

AAA Meeting At Palm Springs

The 10th annual convention of the California Agricultural Aircraft Association will be held Jan. 14, 15, and 16 at the El Mirador Hotel in Palm Springs, Calif.

The topic of the meeting is to be safer and more scientific methods of protecting California's agricultural crop and forest lands through wider use of airplanes. Discussions are expected to feature the need for a better understanding by the public of the operations of aerial crop dusters, and the problems of industry improvements.

•

Combination Spreader Body

The Simonsen Manufacturing Co., Quimby, Iowa, is offering the Feedilizer, a combination bulk feed and fertilizer body that will hold 8½ tons of fertilizer or 5.2 tons of feed in its two compartments.

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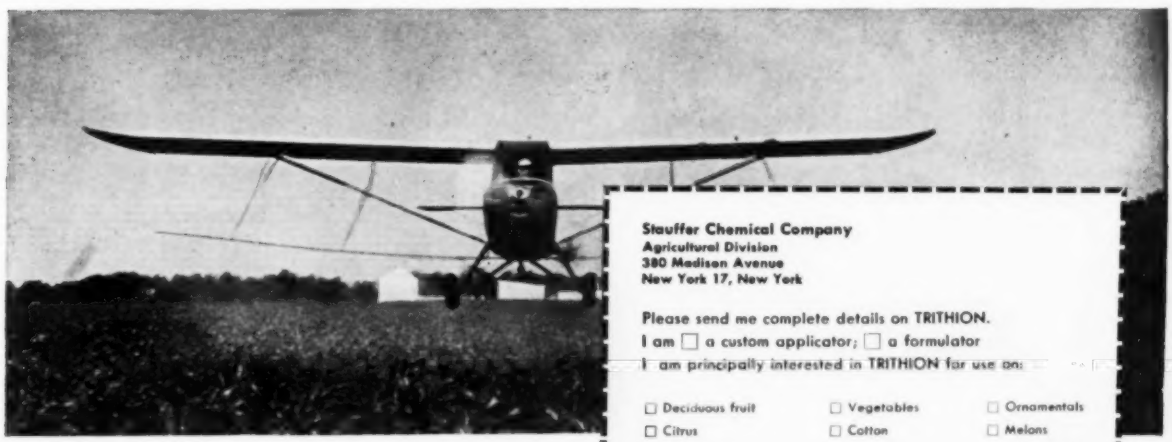

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NATA Convention Dates

The 20th annual convention of the National Aviation Trades Association will be held at the Hotel Monteleone in New Orleans, La., Nov. 16 to 20, 1959.

In 1960, NATA will meet Nov. 8 to 11 in Oklahoma City. In 1961, the association plans to meet Nov. 14 to 17 at a site to be announced.

•

Applicator's Safety Handbook

A handbook prepared by the Safety Committee of the Agricultural Aircraft Association, Inc., Fresno, Calif., to enable ground crew personnel to understand the hazards of their work, has met with approval from many directions: operators, insurance men, FAA, chemical companies, pilots, and others.

The 18-page booklet limits instructions to those which are practiced by every operator in the U.S. Space is allowed in the booklet for "special" instructions for specific areas to be inserted.

Copies are available through the CAAA office at 20¢ a copy.

•

Australian Spray Figures

Statistics compiled by the Australian Department of Civil Aviation, Melbourne, show that 2,381,000 acres were treated from the air in 1958. Superphosphate was spread over 1,308,000 acres, about 87 per cent of which were in New South Wales and Victoria.

Insecticides and herbicides were spread over a total area of 807,000 acres. A total flying time of 28,000 hours was expended in aerial agricultural operations.

•

British Helicopter Spraying

British European Airways, one of Europe's largest airlines, is using passenger helicopters for crop spraying this year. Three times the size of helicopters normally used for spraying, the passenger craft have been fitted with new spraying gear which includes non-drip plastic nozzles, plastic booms, and corrosion resistant tanks. The length of the boom has been increased from 23 to 30 feet, thus increasing the swath from 70 to 100 feet. It is expected that the spraying rate will be increased from the 1958 figure of 68 acres to 100 acres per flying hour.

Helicopters used by a Scottish whaling firm to spot Antartic whales (craft normally laid up during the English summer) also are being used this summer for spraying on farms in Britain.

Complete Largest Project

The Arizona Aerial Applicators Association (28 companies with 94 airplanes) recently completed the largest row-crop aerial application project ever undertaken in the United States.

More than 17 million pounds of DDT sprays and dusts were dropped from airplanes on 75,000 acres of cotton in Arizona to kill pink bollworm. The Government cooperated with farmers in contracting the job.

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PEST ROUNDUP

By Kelvin Dorward

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Survey & Detection Operations, Plant Pest Control Division, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in U.S.D.A.'s pest surveys throughout the U.S.

Grasshopper Populations Light, Need Only Local Controls

Grasshopper populations were such that only localized areas required control measures during July. Damaging populations on croplands were reported from eastern and northeastern New Mexico counties where controls were applied to fields and fence rows in various areas. The Federal-State-Rancher cooperative grasshopper control program in New Mexico accounted for a total of 275,000 acres of rangeland being treated. A severe grasshopper outbreak in July on rangeland in Golden Valley County, North Dakota, resulted in a cooperative control program on approximately 13,000 acres . A localized area with grasshopper populations up to 125 per square yard required control in Boise County, Idaho. Some damage from hoppers was reported from areas of Box Elder, Kane, and Washington Counties, Utah. Controls were applied to 14,000 acres in Kane County.

A fungus reduced grasshopper populations in many areas of California below the economic level. In one area, populations were less than one per square yard compared with more than 5 in 1958. Heavy populations in cropland were reported from several central and coastal counties of Texas, but serious range populations failed to develop. In one area of Archuleta County, Colorado, ranchers and farmers organized a control program, but in general grasshopper populations in the state were low. Populations in Montana were reported to be the lightest in the past five years.

Corn Borer Controls Effective

The European corn borer, by late July, was causing more damage to sweet corn in central and southern Maryland than in 1958. Reports of field corn damage were received from Grayson, Loudoun, and Wythe Counties, Virginia.

Second generation borer damage was not expected to be severe in Illinois, and the borer was the lightest in 10 years in Minnesota. The majority of the north central states reported rather light egg mass counts and feeding signs. Nebraska reported the heavier infestations of that State to be in early planted corn of the eastern section. It is of particular interest that considerable corn acreage in northern Alabama was treated for the European corn borer in June.

The corn leaf aphid was of concern in several areas during July. In the central Brazos River area of Texas, the insect caused serious damage to young grain sorghums. Infestations of 10-85 per cent were in grain sorghums throughout Missouri. The insect could be found in all sorghum fields of several central Kansas counties. Indiana reported heavy populations on sorghum in Vermillion County and on corn in Tippecanoe County. Several barley fields were treated for the insect in Millard County, Utah.

Alfalfa Pest Damage Severe

The spotted alfalfa aphid continued to increase in central and southwestern Arizona alfalfa fields, and to be a problem in southern New Mexico. Counts up to 1,000 per sweep were recorded in Alfalfa County, Oklahoma, and plant damage was evident. Heavy populations were observed in Etowah County, Alabama. These infestations constituted a new county record for the state. Populations up to very heavy were recorded in south central and southeastern Virginia.

Infestations of the potato leafhopper caused severe damage to alfalfa in north central Indiana. Yellowing of plants was also reported from Illinois and Missouri. Populations of the insect were heavy in some southeastern Virginia peanut fields, and controls were expected to be needed.

The rice water weevil was reported from rice and grasses near Biggs, Butte County, California, in early July. The infestation found represented the first record for the state and West Coast for this important rice pest. Surveys through the middle of July had revealed the pest to occur on rice and grasses in a 500 square mile area in portions of Butte, Glenn, and Yuba Counties.

Mite Buildup Reported on Fruit

Mites were one of the principal fruit pests during July. These pests were on the increase in both Massachusetts and Delaware. Hot, dry, temperatures were ideal for the buildup of mites in Indiana. Heavy populations in the Vin-

cennes, Indiana area warranted control in both apple and peach orchards. The Orleans area of Indiana also reported heavy mite populations. Buildups were reported from South Carolina, New York, Michigan, Ohio and Minnesota. Bronzing of leaves occurred in Missouri and Kansas and considerable damage resulted to apples from mites in New Mexico.

The buildup of codling moths was greater in the Cape Girardeau, Missouri area than had been expected. In one orchard in Payne County, Oklahoma, "worry apples" averaged 44 per cent, a 100 per cent increase over the infestation found in June. Codling moths were heavy in cherries in the Happy Camp area of Siskiyou County, California.

Vegetable Pests

Among the vegetable insects causing damage during July were the Colorado potato beetle and flea beetles. The Colorado potato beetle caused damage in Jerome and Minidoka Counties, Idaho. Complete defoliation of some plants was noted. The beetle was taken in Cache County, Utah, during July, apparently for the first time. In Maryland infestations of the insect were heavy in untreated fields.

Flea beetles were heavy on eggplant in Racine and Kenosha Counties, Wisconsin, and killed potato plant tops in Allegany County, Maryland. Heavy populations were reported on horseradish in New Castle County, Delaware, and on potatoes near Corvallis, Oregon.

Cotton Pest Controls Needed in Calif.

By the latter part of July, cotton boll weevils were on the increase in certain areas, while in others the insect was very light. Activity was on the increase in the upper Coastal Plain and Piedmont counties of North Carolina. In South Carolina, treated fields carried low boll weevil populations, but the potential for higher infestations was developing with some fields showing square infestations up to 90 percent. Boll Weevil infestations increased generally over Alabama with infestations in the central area ranging up to 100 per cent. With the exception of areas in Texas, other reporting states had low weevil populations. A general increase was noted in central Texas as the second generation emerged.

Bollworms were damaging cotton, and controls were necessary in the Imperial Valley, Imperial County, California. There was a rapid buildup of the insect in southern New Mexico during the latter part of July. Controls were necessary. Activity of the bollworm increased in most areas of Texas with heavy egg deposition being reported. Activity also increased markedly in the delta counties of Miss. and Madison Parish, La.

An interesting early season note relative to forest pests pertains to spider mites. An outbreak of mites occurred on 10,000,000 acres of shortleaf and loblolly pine in southern Arkansas and northern Louisiana. Populations were estimated to average one million mites on each of many hundreds of thousands of trees. Heavy rains in late May and June reduced the infestation and new growth points to good recovery. Spider mites were heavier on evergreen nursery stock and ornamentals in northeastern Pennsylvania during July than in several years. Mites were heavy on willows and cotton woods in Prairie County, Montana, on ornamental evergreens in the Reno, Nevada, area and on boxelders in Sacramento, California.

Elm leaf beetles were abundant and causing damage in some areas of New Jersey. Very heavy feeding on elms was noted in Sussex County, Delaware, and complete defoliation occurred locally on Chinese elms in Wake County, North Carolina. General infestations of the beetle were present in Jerome County, Idaho.

A May beetle *Phyllophaga bruneri* was reported for the first time in the United States from Miami, Florida in June. The insect caused considerable damage to various trees in north central Dade County. Further survey is underway and studies are being made to determine the potential economic importance of the beetle.

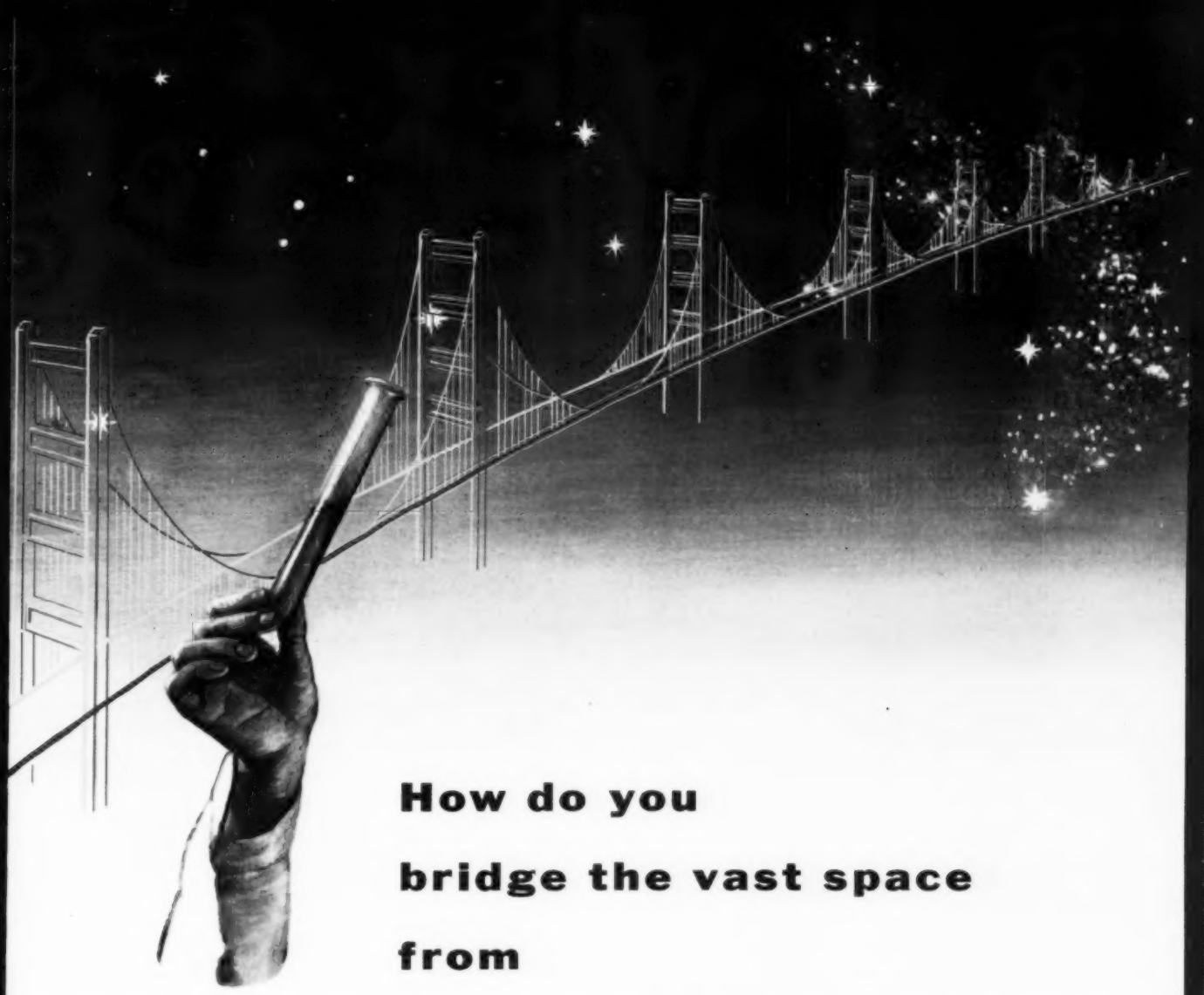
An insect known to have been in the country since 1953 has recently become a seriously annoying pest on cattle in Ohio and Indiana. The insect, a muscid fly, *(Musca autumalis)* was first found in North America in 1952 in Nova Scotia, Canada. The 1953 United States record is from Long Island, New York. Presently, the insect is known to be in New York, Maine, Virginia, Ohio, and Illinois. The flies evidently prefer to cluster on the faces of cattle, under and around the eyes, in and around nostrils, and at the lips. Horses and sheep have also been reported as being annoyed by the flies.

European Chafer Spreads

A single specimen of European chafer, a root-feeding lawn and forage pest, was found in July near Capon Bridge, W. Va., the first chafer find in West Virginia since 1954.

The European chafer, first discovered in the United States in western New York in 1940, has been slowly spreading despite Federal-State efforts to stop it with quarantines and insecticidal treatments. It was confined to nine counties in western New York and an area near Meriden, Conn., until 1954, when an infestation at Capon Bridge was discovered. Insecticide treatments were thought to have eradicated this outlying infestation.

Research is underway to improve soil and plant treatments used to comply with quarantine restrictions, and to improve detection traps. Black-light traps, a development of research, are proving to be valuable aids to chafer surveys. These traps uncovered the recent West Virginia infestation and have been useful in delimiting the New York infestation.★★



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1958 Fertilizer Use is Down But Nutrient Content is Up

THE complete report on the "Consumption of Commercial Fertilizers and Primary Plant Nutrients in the United States for the year ended June 30, 1958" has just been received from the Fertilizer Investigations Research Branch, Soil and Water Conservation Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Md. The report was prepared by Walter Scholl, Marion M. Davis, Esther I. Fox, and Anna W. Woodard.

The most significant figures from the report are presented in the following summary. Complete copies of the final report may be obtained from the Fertilizer Investigations Research Branch at Beltsville.

National Totals

The total quantity of fertilizer consumed in the year ended June 30, 1958, was 22,515,763 tons. Included in this total were 21,576,035 tons of products containing one or more of the primary nutrients and 939,728 tons of secondary and trace nutrient materials.

This represented a decrease of 0.9% from the previous year (56-57) when the consumption of fertilizers containing primary nutrients was 21,765,768 tons, plus 943,243 tons of secondary and trace nutrient materials. In spite of the decreased tonnage, the consumption of active plant nutrients registered a 2.1% gain, because of higher concentration of the fertilizers produced.

The decreased tonnage in 1957-58 resulted from a drop of 349,784 tons of mixtures, which was partially offset by an increase of 160,051 tons of direct application materials. This was the fifth consecutive year since the peak of 1952-53 that the quantity of mixtures has decreased. The consumption of direct application materials, however, has increased annually except in 1952-53 and 1953-54. The decrease in total consumption was chiefly in the south Atlantic and east south central regions. Consumption in the north central, mountain, and Pacific regions continued to gain.

Mixtures

The total consumption of commercial mixtures in 1957-58 amounted to 14,353,023 tons. There were 2,156 grades reported.

N-P-K mixtures represented 90.2% of the total tonnage of mixtures, while the other types (N-P, P-K, N-K) accounted for 2.4%, 5.7%, and 1.7%, respectively.

Materials

During the last fiscal year, the total consumption of materials for direct application, including secondary and trace nutrient materials, amounted to 8,162,740 tons—36.3% of all fertilizers used, compared with 35.3% for the preceding year. The quantity of these materials was 156,536 tons more than in 1956-57.

An increase in the consumption of chemical nitrogen materials was due largely to the greater use of anhydrous ammonia, nitrogen solutions, and ammonium sulfate. The total consumption of nitrogen solutions and aqua ammonia was 9.9% higher in 1957-58. The use of ammonium sulfate was 11.8% higher.

The total uses of ammonium nitrate-limestone mixtures and sodium nitrate decreased 12.3% and 11.7%, respectively, in 1957-58. The use of urea decreased 9.7%.

The consumption of phosphate materials decreased 12,118 tons from 1956-57. The principal change was in the use of colloidal phosphate and phosphate rock, an increase of 15,362 tons (1.8%). The use of superphosphates (22% grades and under) decreased 82,108 tons (14.7%) and the consumption in all areas was lower than in 1956-57.

There was less consumption of potash materials in 1957-58 by 12,361 tons (2.7% lower than 1956-57). This is the first time in many years that the total tonnage of these products has not shown an increase. The use of the 50-62% grades of potassium chloride, which comprised 81.3% of the total consumption of potash materials, decreased 11,379 tons (3%). The use of lime-potash mixtures and manure salts decreased, while increases were shown for potassium-magnesium sulfate (28%), potassium-sodium nitrate (58%), and potassium sulfate (2%).

Primary Plant Nutrients

The fertilizers used in 1957-58 contained a total of 6,512,387 tons of N, available P_2O_5, and K_2O. The consumption of primary nutrients was 135,185 tons (2.1%) more than that (6,377,202 tons) in 1956-57. In 1957-58 primary nutrients consumed comprised 2,284,359 tons of N, 2,292,890 tons of available P_2O_5, and 1,935,138 tons of K_2O.

The national weighted average of primary nutrients in all fertilizers containing these nutrients was 30.18% in 1957-58 an increase from the 29.30% figure in the preceding year.

National use of nitrogen increased 149,072 tons in the '57-'58 crop year, of which 7.8% was supplied by mixtures and 92.2% by materials. The increase in nitrogen was largest in the west north central region, followed by the east north central and Pacific regions.

The national use of available P_2O_5 decreased 12,102 tons. The quantity in mixtures decreased 19,036 tons, while that in materials increased 6,934 tons. The decrease was largely in the south Atlantic and east south central regions. Principal increases were noted in the east north central and Pacific regions for mixtures, and in the east and west north central and mountain regions for materials.

The national use of K_2O decreased 1,785 tons. Use in mixtures increased 2,798 tons while that in materials decreased 4,574 tons. Higher consumption of K_2O in mixtures, chiefly in the south Atlantic, east north central, and Pacific regions, more than offset lower use in other areas.★★

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Effective Utilization is Stressed at Alabama Fertilizer Meeting

THE fertilizer industry can help agriculture and the industry itself by promoting the most effective utilization of its products. This thought was brought to the attention of some 125 members of the fertilizer industry attending the 1959 Alabama Fertilizer Conference, August 18 and 19, by Dr. J. T. Cope, Jr., associate agronomist of the API Agricultural Experiment Station.

The researcher pointed out that fertilizer use is tied in with all other phases of farm management. In order that farmers obtain maximum benefits from fertilization, Dr. Cope declared that all other factors involved must be considered. He advised the fertilizer men to promote use of all good farm practices while selling farmers on using adequate fertilizer.

Ingredients other than fertilizer that go into production of farm crops include land selection and preparation, crop selection, rotations, liming, time of planting, seed treatment, spacing, weather, cultivation, weed control, insect and disease control, and harvesting for quality. A shortage of any of these factors can limit production, he pointed out. When one factor limits production below the maximum, all other factors have been supplied in excess and at excessive cost.

Land selection for crops is important in Alabama, Dr. Cope said, since the land is poorer than in some other areas. He advised planting high value crops like cotton on the best land available, and suggested that crops such as alfalfa, white clover, crimson clover, and Coastal Bermudagrass be planted on suitable soils to be successful. Good crop rotations can increase the efficiency of fertilizers applied, help control diseases, nematodes, and weeds, and improve soil structure and other physical characteristics.

Although Alabama averages 50 or more inches of rainfall a year, crop yields suffer more from a lack of soil moisture than from any other one factor, Mr. Cope declared. He said this was due to poor rainfall distribution, and low moisture holding capacity of soils. He said irrigation is the only effective means of avoiding drought effects, but explained that the cost is high and limits the acreage that can be irrigated.

With high value crops that can be irrigated, the researcher stated, fertilizer needs may increase considerably. Because of the increase in productive capacity and in investment, supplying adequate fertility is especially important. He said the fertilizer industry should make a special effort to see that no farmer who goes to the expense of irrigation lets fertility limit his yields.

In a talk on soil testing, Dr. R. D. Rouse, Experiment Station soil chemist, said three kinds of information are needed for making recommendations from soil tests. These are: (1) what makes an adequate level of available nutrients in the soil, (2) how much fertilizer is needed for maximum profitable response, and (3) amount of fertilizer needed to maintain soil fertility. Research results on these three problems is the basis for recommendations made at Auburn.

The importance of using enough fertilizer to maintain soil fertility was emphasized by Dr. Rouse. More fertile soils produce higher yields than poorer soils, even when high rates of fertilizer are used, he said.

The problem of losing nitrogen from the soil was discussed by Dr. C. E. Scarsbrook, soil chemist. He said that until recently, leaching was thought to be the major way that nitrogen was lost, but it has now been shown that large amounts may be lost to the atmosphere even in well aerated soils. Because of this, it is not recommended to apply nitrogen in the fall for crops to be planted the following spring.

Presentation of the National Plant Food Institute achievement award for being the outstanding junior in agronomy in the API School of Agriculture was made to Troy Glen Dobbins, Long Island, Ala., by Dr. Garman of NPFI.

The two-day Conference had sessions at the North Alabama Horticulture, Tennessee Valley, and Upper Coastal Plain Substations of the API Experiment Station System, and at the TVA Fertilizer and Munitions Development Center at Wilson Dam. Sponsors were the Experiment Station and Extension Service of The Alabama Polytechnic Institute in cooperation with the Alabama Soil Fertility Society.★★

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Potash Deliveries Up 17%

Deliveries of potash for agricultural purposes by the eight American potash producers from July '58 through June '59 totalled 3,968, 323 tons of salts containing 2,325, 485 tons K_2O; an increase of 17 per cent over the previous year.

EDITORIALS

(*From Page* 35)

restrict control and direction to a single government agency, or to conduct it without regard to previous research would certainly undermine confidence in whatever findings might result. If there is to be such a research program, it is obviously in the national interest to have it conducted in an impartial scientific way. The findings, if they are to mean anything, must be based, not on bias, but on sound scientific procedure.

'59 '60 BUYERS' GUIDE

for the agricultural chemicals trade

- MANUFACTURERS
- MIXERS
- FORMULATORS

of

- FERTILIZERS
- INSECTICIDES
- FUNGICIDES
- HERBICIDES

PLUS

A Separate Listing of Equipment and Supplies for the AGRICULTURAL APPLICATOR

ON PAGES 90-92

THIS Buyers' Guide differs in several respects from other such compilations that have been prepared for use in the agricultural chemicals industry. To begin with, it has been designed primarily for use by "the trade,"—by manufacturers, mixers and formulators of pesticides and fertilizers, rather than by dealers and end users. It contains no lengthy lists of suppliers of finished products, but is confined primarily to basic sources of raw materials used in making these end products. Thus when we list suppliers of such pesticides as DDT, BHC, endrin, chlordane, etc., we have confined our listings to suppliers of the technical materials, rather than trying to cover all the firms that sell finished products made therefrom. The same applies to fertilizers, fungicides, herbicides, etc.

Second, we have put our main emphasis on listing basic producers rather than resellers. The test has been "does the source manufacture, mine or otherwise produce the item in its own facilities, does it act as an exclusive sales agent for such a producer, or does it import directly from a foreign producer?" Rather than compiling a long list of local sources of supply, we have tried to confine our listings to basic producers in position to supply substantial tonnages at producers' prices. As a result our guide is much more compact and readily useable than others that have been published. We list dealers only in a dealers' listing.

Within these limits we have tried to make the guide as complete as possible by listing every basic source of supply with which we are familiar. No names have been purposely omitted. If you are a basic supplier of any of the materials listed, or of other articles which you believe should be included in this guide, just let us know and we will be happy to make the necessary changes before publishing our 1960 edition. It is our wish to make this guide as complete and accurate as possible, within the limits outlined. There will be some errors and omissions, we know, in this first edition, and we will welcome the assistance of users of the guide in correcting them.

Now, a note about using the guide. We have made every effort to eliminate the duplications of listings common to so many guides, confining our listings to the minimum practical rather than repeating the names of the same group of suppliers half a dozen times under essentially the same basic headings. Thus, there is a listing for diluents, but none for carriers,—one for baits, but none for attractants. We list suppliers of anhydrous ammonia, urea, nitrogen solutions, ammonium sulphate, etc. under the one basic heading of Nitrogen Raw Materials, indicating for each company so listed what specific items are supplied. A fairly complete list of cross references refer the buyer directly to the basic product listing. We hope the compact make-up and format of the guide will make it a volume which can be kept handy for repeated reference through the year.

ADJUVANTS, SPRAY — See Sprayers-Stickers, Wetting Agents, Solvents, Emulsifiers

AGITATORS — See Mixers

ALDRIN — See Insecticides

ALLETHRIN — See Insecticides

AMMONIATOR-GRANULATORS

Blue Valley Equip. Mfg. Eng'g. Co.
Topeka, Kans.

Davidson Kennedy Co.
Box 97, Station D, Atlanta, Ga.

Link Belt Co.
Prudential Plaza, Chicago 1

McDermott Bros.
Washington & 3rd, Allentown, Pa.
See advertisement on page 119

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24
See advertisement on page 121

A. J. Sackett & Sons
1337 S. Highland Ave., Baltimore

Stedman Foundry & Machine Co.
Aurora, Ind.

Sturtevant Mill Co.
123 Clayton St., Boston 22
See advertisement on page 131

Worthington Corp.
Harrison, New Jersey

ANIMAL FEED SUPPLEMENTS

Eastman Chemical Products, Inc.
Kingsport, Tenn.
See advertisement on page 26

International Minerals & Chemical Corp.
Skokie, Ill.
See advertisement on page 48-49

U. S. Industrial Chemicals Co.
99 Park Ave., New York 16
See advertisement on page 28

ANTIBIOTICS — See Fungicides

APPLICATING EQUIPMENT and SUPPLIES — See Pgs 91-94

ARSENATES — See Insecticides

ATTRACTANTS — See Baits

BHC — See Insecticides

BAGS (Cloth)

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2

Chase Bag Co.
309 W. Jackson Blvd., Chicago

BAGS (Multiwall)

Albermarle Paper Mfg. Co.
P. O. Box 2189, Richmond 17

Ames Harris Neville Co.
2600 84th St., Berkeley 10, Calif.

Arkell Safety Bag Co.
6345 W. 65th St., Chicago 38

Bagpak, Div., Int'l. Paper Co.
220 E. 42nd St., N. Y.

Bemis Bro. Bag Co.
601 S. 4th St., St. Louis

Chase Bag Co.
509 W. Jackson Blvd., Chicago

Crown Zellerbach Corp.
231 Sansome St., San Francisco

Continental Can Co.
100 E. 42nd St., N. Y. 17

Hudson Pulp & Paper Co.
505 Park Ave., N. Y.

Kraft Bag Corp
630 5th Ave., N. Y. 20

Olin Mathieson Packaging Div.
W. Monroe, La.

Owens Illinois Glass Co.
Toledo 1, O.

Percy Kent Bag Co.
5910 Vinner Blvd., Kansas City, Mo.

Raymond Bag Corp.
Middletown, Ohio

St. Regis Paper Co.
50 E. 42nd St., N. Y. 17

Union Bag-Camp Paper Corp.
233 Broadway, N. Y.

West Virginia Pulp & Paper Co.
230 Park Ave., N. Y. 17

BAGS (Paper, lined and unlined)

Bagpak Div., International Paper Co.
220 E. 42nd St., N. Y. 17

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2

Chase Bag Co.
309 W. Jackson Blvd., Chicago

Chippewa Plastics
Chippewa Falls, Wis.

Continental Can Co.
Flexible Packaging Div.,
Devon, Pa.

Crown Zellerbach Corp.
231 Sansome St., San Francisco

Kraft Bag Corp.
630 Fifth Ave., New York 20

Raymond Bag Corp.
Middletown, Ohio

St. Regis Paper Co.
50 E. 42nd St., New York 17

Union Bag-Camp Paper Corp.
233 Bway, New York

Universal Paper Bag Co.
New Hope, Pa.

West Virginia Pulp & Paper Corp.
230 Park Ave., N. Y. 17

BAGGING — Thread

Bemis Bro. Bag Co.
408 Pine St., St. Louis, 2
(Acid resistant thread)

E. I. du Pont de Nemours & Co.
Textile Fiber Dept.
Wilmington, Del.

BAG PACKING, WEIGHING AND CLOSING MACHINERY

Bagpak Div., International Paper Co.
220 E. 42nd St., New York 16

Black Products Co.
13513 S. Calumet Ave., Chicago 27

Bemis Bro. Bag Co.
408 Pine St., St. Louis 2

Burrows Equipment Co.
1316-AC Sherman Ave., Evanston, Ill.

Chase Bag Co.
155 E. 44th St., N. Y. 17

Coddington Mfg. Co.
5024 N. 37 St., Milwaukee 9, Wisc.

Exact Weight Scale Co.
Columbus, O.

Dave Fischbein Co.
38 Glenwood Ave., Minneapolis

George H. Fry Co.
42 E. 2nd St., Mineola, N. Y.

Inglett & Co., Inc.
P. O. Box 3425, Augusta, Ga.

Kraft Bag Corp.
630 Fifth Ave., N. Y. 20

Raymond Bag Corp.
Middletown, O.

Richardson Scale Co.
Clifton, N. J.

Stoker Co., H. L.
111 S. College Ave., Claremont, Calif.

St. Regis Paper Co.
150 E. 42nd St., N. Y. 17

Thayer Scale Corp.
Pembroke, Mass.

Union Bag-Camp Paper Corp.
233 Broadway, N. Y. 17

Union Special Machine Co.
412 N. Franklin St., Chicago 10

BAITS and ATTRACTANTS (To be combined with pesticides in the formulation of finished insecticide baits)

Givaudan-Delawanna, Inc.
321 W. 44th St., New York 36
(Methyl Eugenol)

Nutritional Biochemicals Co.
21010 Miles Ave., Cleveland
(Yeast Hydrolysate)

A. E. Staley Mfg. Co.
Decatur, Ill.
("P.I.B." Protein Insecticide Baits)

Marvin R. Thompson
52 Davenport St., Stamford, Conn.

BARREL LINERS

Arkell Safety Bag Co.
6345 W. 65 St., Chicago 38, Ill.

Bemis Bro. Bag Co.
408 Pine St., St. Louis 2

Kalamazoo Vegetable Parchment Co.
Parchment, Mich.

Donald Palmer, Inc.
2627 Tchoupitoulas St., New Orleans

BHC — See Insecticides

BIN INDICATING DEVICE

Bin-Dicator Corp.
13946 Kercheval, Detroit, Mich.

BIN — Vibrator

Cleveland Vibrator Co.
2828 Clinton St., Cleveland, Ohio

B. W. Elliott Mfg. Co.
Binghamton, N. Y.

Gerotor May Corp.
Owings Mills, Md.

Syntron Co.
579 Lexington Ave., Homer City, Pa.

BLENDERS — See Mixers

BONE MEAL

Baugh Chemical Co.
25 S. Calvert Stflfi Baltimore, Md.

Consolidated Chemical Industries
6910 Fannin St., Houston, Texas

Darling & Co.
4101 S. Ashland Ave., Chicago 9

Faesy & Besthoff, Inc.
25 E. 26th St., New York 10
See advertisement on page 136

Van Iderstine Co.
37030 Riview Ave., L. I. C., N. Y.

BORATES

American Potash & Chemical Corp.
3000 W. 6th St., Los Angeles 54

U. S. Borax & Chemical Corp.,
Pacific Coast Borax Co. Div.
630 Shatto Pl., Los Angeles 5

BUCKETS

Blaw Knox Co.
300 6th Ave., Pittsburgh 22

Inglett & Co.
Augusta, Ga.

C. S. Johnson Co.
Champaign, Ill.

CALCIUM ARSENATE — See Insecticides

CARTONERS and CARTON PACKERS

Burt Machine Co.
401 E. Oliver Street, Baltimore 2. Md.

Chisholm-Ryder Co. of Pennsylvania
Blettner Avenue, Hanover, Pa.

Clybourn Machine Corp.
6479 N. Avondale, Chicago 31, Ill.

J. L. Ferguson Co.
Route 52, Joliet 3, Ill.

R. A. Jones & Co.
P. O. Box 485, Cincinnati, O.

National Equipment Corp.
153-7 Crosby Street, New York, N. Y.

Pneumatic Scale Corp.
65 Newport Ave., North Quincy 71, Mass.

Standard-Knapp Div., Emhart Mfg. Co
Portland, Conn.

Stokes & Smith Co.
5915 Summerdale Ave., Philadelphia, Pa.

Triangle Package Machinery Co.
6633 West Diversey Blvd., Chicago, Ill.

Agricultural Chemicals' staff has done its best to compile an accurate, useful Buyers' Guide. — Still errors and omissions are bound to occur. We shall greatly appreciate it if readers will let us have suggestions for changes needed before publication of the 1960-61 Buyers' Guide. Send to:

AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

CATTLE DIPS AND SPRAYS

California Spray-Chemical Corp.
Richmond, Calif.

Chemical Service of Baltimore
Howard & West St., Baltimore

Eagle Soap Co.
Huntington, Ind.

Haag Laboratories, Inc.
140th & Seeley, Blue Island, Ill.

Higley Chem. Co.
Dubuque, Iowa

R. M. Hollingshead Corp.
Camden, N. J.

Hysan Prods. Co.
936 W. 38th Place, Chicago

Peck's Prod. Co.
610 E. Clarence Ave., St. Louis

Rex Research Corp.
Toledo, Ohio

Standard Oil Co. (Ohio)
Midland Bldg., Cleveland

Thompson-Hayward Chem. Co.
2915 Southwest Blv., Kansas City, Mo.

James Varley & Sons
1200 Switzer Ave., St. Louis

CATTLE GRUB CONTROL PREPARATIONS

Chemagro Corp.
437 Fifth Ave., New York
(Co-Ral)

Dow Chemical Co.
Midland, Mich.
(Trolene)

CHELATING AGENTS

Dow Chemical Co.
Midland, Mich.
(Versenes)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Sequestrenes)
See advertisement on page 16

Hampshire Chemical Corp.
Poisson Ave., Nashua, N. H.

Refined Products Corp.
624 Schuyler, Lyndhurst, N. J.
(Perma Green)

CHLORDANE — See Insecticides

CLOTHING PROTECTIVE (gloves aprons, guards, etc.) see also Masks

Acme Protection Equipment Co.
1201 Kalamazoo St., S. Haven, Mich.

American Optical Co.
Mechanics St., Southbridge, Mass.

Charleston Rubber Co.
21 Stark Ind. Park, Charleston, S. C.
(Gloves)

Disposables, Inc.
11 Mercer St., New York 13
(Disposable Paper Work Clothes)

Hub States Chemicals & Equpt.
1255 Windsor St., Indianapolis 1, Ind.

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8

CONDITIONERS (Fertilizer)

Aquafil Co.
321 State St., Los Altos, Calif.
See advertisement on page 118

Eagle Picher Co.
Central Pkway & Walnut St., Cinn.
(Celatom)

International Commodities Corp.
11 Mercer St., New York 13, N. Y.
See advertisement on page 112

Johns Manville Corp.
22 E. 40th St., N. Y. 16
(Celite)
See advertisement on page 17

Minco Products Co.
Box 367, Saginaw, Mich.

Moores Lime Co.
Springfield, Ohio
(Doloxide)

National Aniline Div.,
Allied Chem. Corp.
40 Rector St., New York
See advertisement on page 12

Quaker Oats Co.
Merchandise Mart, Chicago 54
(Fur. Ag.)

Ultra Chemical Works
Paterson 4, N. J.
(Sulframin)

U. S. Graphite Co.
Saginaw 17, Mich.

Universal Detergents, Inc.
1825 E. Spring St., Long Beach, Calif.
(UDET-F)

Zonolite Co.
135 LaSalle St., Chicago 3
(Terralite)
See advertisement on page 130

CONTAINERS (for consumer packages of pesticides, fertilizers, etc.) —See also Pails

Bradley Container Corp.
Thompson St., Maynard, Mass.

Cleveland Containers
6201 Barberton Ave., Cleveland 2

Harcord Mfg. Co.
125 Monitor St., Jersey City, N. J.

R. C. Can Co.
9430 Page Blvd., St. Louis 14

CONTRACTORS—See Fertilizer Plants

CONSULTANTS AND RESEARCH AGENCIES

Agricultural Aviation Eng'g. Co.
858 Scott St., Santa Clara, Calif.
(Aerial)

Battelle Memorial Institute
505 King Ave., Cambridge 42, Mass.

Bio-Search & Development Co.
2019 W. 71st Terrace, Kansas City
(Research and Development)
See advertisement on page 139

Alvin J. Cox, Ph.D.
118 Emerson Street, Palo Atlo, Calif.
See advertisement on page 139

Doane Agricultural Service
5142 Delman Blvd., St. Louis
(marketing studies)

Edwards Laboratory
Norwalk, Ohio
(Soil Testing Service)

Evans Research and Development Corp.
250 E. 43rd St., New York 17
(Product Development. Evaluation)

Florida Field Trials
Dr. G. R. Townsend, Belle Glade, Fla.
(Field Trials, Chemical Evaluation)
See advertisement on page 139

Food & Drug Research Laboratories Inc.
Maurice at 58th St., Maspeth 58, N. Y.
(Toxicological and Inhalation Studies)

Hazleton Laboratories
Falls Church, Va.
(Inhalation Studies, Toxicity Tests)

Hill Top Research Institute, Inc.
Miamiville, O.
(Toxicity, Irritation Tests)

Leberco Laboratories
123 Hawthorne St., Roselle Park, N. J.
(Toxicity, Irritation Studies)

Dr. Emery D. Robert
3121 N. Sheridan Rd., Chicago, 14
(Market Surveys, Technical Research and Development)

Rosner-Hixon Laboratories
7737 S. Chicago Ave., Chicago, 19
(Toxicity, Irritation Studies)

Scientific Associates
3755 Forest Park Ave., St. Louis 8, Mo.
(Animal Studies, Toxicity and Bacteriological Testing)
See advertisement on page 139

Foster D. Snell, Inc.
29 West 15th St., New York 11
(Research, Testing and Developing)
See advertisement on page 139

Sperling Laboratories
8815 N. 24th Street, Arlington, Va.
(Research, Testing, Toxicity)
See advertisement on page 139

Theodore Riedeburg Associates
415 Lexington Ave., New York, 17
(Testing, Marketing)
See advertisement on page 139

United States Testing Co.
1415 Park Ave., Hoboken, N. J.
(Research, Testing, Toxicology)

Wisconsin Alumni Research Foundation
P. O. Box 2217-DD, Madison 1, Wis.
(Formulation, Labeling, Testing)

Wolf's Agricultural Laboratories
2620 Taylor St., Hollywood, Fla.
(Testing, Chemicals Evaluation)
See advertisement on page 139

CONVEYORS Bags, Drums

Barber Green Co., (belt conveyor)
Aurora, Ill.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Carrier Conveyor Corp.
206-A No. Jackson St., Louisville, Ky.

Farquhar Div., (belt conveyor)
York, Pa.

Fuller Co. (pneumatic conveyors)
Catasauqua, Pa.

Inglett & Co.
P. O. Box 3425, Augusta, Ga.

Jeffrey Mfg. Co.
E. First Ave. & 4th St., Columbus 16,

Joy Manufacturing Co. (belt conveyor)
401 Oliver Bldg., Pittsburgh

Kennedy-Van Saun Manufacturing & Eng'g. Corp.
405 Park Ave., New York 22
(pneumatic conveyor)

C. S. Johnson Co.
Champaign, Ill.

Link Belt Co.
Prudential Plaza, Chicago 1

Power-Curv Conveyor Co.
2185 S. Jason St., Denver 23

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24
See advertisement on page 121

K. E. Savage Co. (bag conveyor)
823 W. 21 St., Norfolk 10, Va.

Sturtevant Mill Co.
123 Clayton St., Boston 22
See advertisement on page 131

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

COOLERS — See Dryers

COPPER SULFATE — See also Fungicides

Faesy & Besthoff, Inc.
25 E. 26 St., New York 10, N. Y.

International Commodities Corp.
11 Mercer St., New York 13, N. Y.
See advertisement on page 112

Phelps Dodge Refining Corp.
300 Park Ave., New York 22

Republic Chemical Corp.
94 Beekman St., New York 38

Tennessee Corp
617 Grant Bldg., Atlanta
See advertisement on page 15

CRUSHERS — See Mills

CRYOLITE

Aluminum Co. of America
Pittsburgh, Pa.

Harshaw Chemical Co.
1945 E. 97th St., Cleveland 6

Pennsalt Chemicals Corp.
Tacoma, Wash.

United Heckathorn
600 S. 4th St., Richmond 4, Calif.
See advertisement on page 134

CUBE — See Insecticides

CUSTOM GRINDING

Fluid Energy Processing & Equipt. Co.
Richmond & Norris Sts., Phila. 25
See advertisement on page 64

Lebanon Chemicals
Lebanon, Pa.
See advertisement on page 141

CUSTOM PACKAGING (finished products for resale under private brand)

Davies Nitrate Co.
118 Liberty St., New York 6
(Fertilizers)

Plant Food Corp.
3711 Medford St., Los Angeles, 63

Private Brands, Inc.
300 S. 3rd St., Kansas City 18, Kans.

DDT — See Insecticides

DDVP — See Insecticides

DEALERS and DISTRIBUTORS (Chemicals)

American-British Chem. Supplies
180 Madison Ave., N. Y.

Amsco Solvents & Chemicals Co.
4619 Reading Road, Cincinnati 29, O.

H. J. Baker & Bro.
271 Madison Ave., N. Y.

Barada & Page
Kansas City, Mo.

Berkshire Chemicals, Inc.
420 Lexington Ave., N. Y. 17
See advertisement on page 114

Bradley & Baker
155 E. 44th St., New York
See advertisement on page 105

John H. Calo Co.
19 Rector St., N. Y. 6

T. G. Cooper & Co.
Cedar & Venango Sts., Phila. 34

Dickerson Co.
Drexel Bldg., Phila.

Eastern Industries
Ridgefield, N. J.

Faesy & Besthoff
26 E. 26th St., N. Y. 10
See advertisement on page 136

Alex C. Fergusson Co.
Drexel Bldg., Phila.

Fort Pitt Chemical Co.
3134 Penn Ave., Pittsburgh

Gaylord Chem. Co.
701 Woodsweather Rd., Kansas City

Globe Chemical Co.
Murray Road, Cincinnati

Griffin Chem. Co.
1000 16th St., San Francisco

Hummel Chemical Co.
90 West St., N. Y.

Innis Speiden & Co.
420 Lexington Ave., N. Y.

Los Angeles Chem. Co.
2200 Santa Fe Ave., Los Angeles

John F. Maher & Co.
1600 Henderson St., Houston, Tex.

Merchants Chemical Co.
60 E. 42nd St., N. Y.

Millmaster Chem. Corp.
295 Madison Ave., N. Y.

Missouri Solvents & Chemicals Co.
419 De Soto Ave., St. Louis 7, Mo.

Ohio Solvents & Chemicals Co.
3470 W. 140th St., Cleveland 11, Ohio

Philipp Bros.
N. Y. Coliseum, New York

Prior Chem. Corp.
420 Lexington Ave., N. Y. 17

G. S. Robins & Co.
126 Chouteau Ave., St. Louis

Robeco Chemicals, Inc.
25 E. 26th St., N. Y.

Southern Solv. & Chem. Corp.
Jefferson Highway, New Orleans

Texas Solvents & Chemicals Co.
8501 Market St., Houston

Thompson-Hayward Chem. Co.
2915 Southwestern Blvd., Kansas City
See advertisement on page 62

Toledo Sols. & Chems. Co.
4051 South Ave., Toledo, O.

Chas. A. Wagner Co.
4455 N. 6th St., Phila.

Wisconsin Solvents & Chemicals Corp.
1719 S. 83rd St., Milwaukee

Wolverine Solv. & Chem. Co.
2940 Stafford Ave., SW, Grand Rapids

Woodward & Dickerson, Inc.
1700 S. Penn Square, Philadelphia 2

DEFOLIANTS — See Herbicides

DERRIS — See Insecticides

DETERGENTS FOR FRUIT WASHING

National Aniline Div., Allied Chem. Corp.
40 Rector St., New York
See advertisement on page 12

Antara Chemicals
435 Hudson St., New York
See advertisement on page 31

Cowles Chemical Co.
7016 Euclid Ave., Cleveland

Colgate Palmolive Co.
300 Park Ave., New York, 22

Diamond Alkali Co.
Union Commerce Bldg., Cleveland

Diversey Corp.
1820 W. Roscoe St., Chicago

DuBois Co.
Cincinnati, Ohio

Essential Chemicals Co.
5906 N. Port Washington Rd., Milw.

National Milling & Chemical Co.
4601 Flat Rock Rd., Philadelphia

Nopco Chemical Co.
60 Park Pl., Newark 1, N. Y.

Oronite Chemical Co.
200 Bush St., San Francisco 20

Procter & Gamble Distributing Co.
Cincinnati, Ohio

Solvay Process Div.
61 Broadway, New York

John T. Stanley Co.
642 W. 30th St., New York

Stepan Chemical Co.
427 W. Randolph St., Chicago

Swift & Co.
Chicago

Ultra Chemical Works
2 Wood St., Paterson, N. J.

Victor Chemical Works
155 N. Wacker Dr., Chicago

Virginia-Carolina Chemical Corp.
501 East Main St., Richmond, Va.

Westvaco Mineral Prods. Div.
161 E. 42nd St., New York 17

Witco Chemical Co.
122 E. 42nd St., New York 17

Wyandotte Chemicals Corp.
Wyandotte, Mich.

DIAZINON — See Insecticides

DIELDRIN — See Insecticides

DIETHYL TOLUAMIDE — See Repellents

DILUENTS, CARRIERS & EXTENDERS

Aquafil Co.
Box 94, Los Altos, Calif.

American Colloid Co.
Merchandise Mart Plaza, Chicago 54

American Talc Co. (Clatyl)
Chatsworth, Ga.

Bell Clay Co.
Gleason, Tenn.

Godfrey L. Cabot, Inc.
77 Franklin St., Boston 10

Calcium Carbonate Co.
520 S. 4th St., Quincy, Ill.
(CCC Diluent)

California Industrial Minerals Co.
Friant, Calif.
(Frianite)

Carbola Chemical Co.
Natural Bridge, N. Y.

Cohutta Talc Co. (Talc)
Dalton, Ga.

Commercial Minerals Co.
310 Irwin St., San Francisco
(calcium carbonate)

Dicalite Div. Great Lakes Carbon Corp
612 S. Flower St., Los Angeles
(Dicalite)

Eagle-Picher Co. (Celatom)
900 American Bldg., Cincinnati, 1

Eastern Magnesia Talc Co. (Emtco)
206 Bank St., Burlington, Vt.

Floridin Co. (Diluex, Florex)
Tallahassee, Fla.

General Reduction Co. (Pikes Peak)
1820 Roscoe St., Chicago, 13

Glendon Div., Carolina Pyrophyllite Co.
Greensboro, N. C.

Georgia Kaolin Co.
511 Westminster Ave., Elizabeth, N. J.

Georgia Talc Co.
Chatsworth, Ga.

Huber, J. M., Corp. (Barden, Suprex)
630 Third Ave., New York, 17

Industrial Minerals & Chemical Co.
6th & Gilman Sts., Berkeley, Calif.
(Soapstone, B56)

International Clay Corp.
Graniteville, S. C.

International Commodities Corp.
11 Mercer St., New York 13
See advertisement on page 112

Johns-Manville Products Corp.
22 East 40th St., New York, 16
(Micro-Cel, Celite)

Kenite Corp.
Harwood Bldg., Scarsdale, N. Y.

Kennedy Minerals Co.
2550 E. Olympic Blvd., Los Angeles 23

DILUENTS, ETC. (Cont.)

W. H. Loomis Talc Corp.
Gouverneur, N. Y.

Magnet Cove Barium Corp.
PO Box 6504, Houston 5, Tex.
(Carriclay, Pulgite, Arrowhead)

Mill White Clay Co.
Attapulgus, Ga.

Minerals & Chemicals Corp. of America
Menlo Park, N. J.
(Attaclay)

Minco Products Corp.
PO Box 367, Saginaw, Mich.

National Kaolin Products Co.
Aiken, S. C.

Southeastern Clay Co. (Velvex)
PO Box 636, Aiken, S. C.

A. E. Staley Mfg. Co. (Lo-Fat Soy Flour)
Decatur, Ill.
See advertisement on page 135

Summit Mining Corp. (Ser-X)
Bashore Bldg., Carlisle, Pa.

Tamms Industries, Inc.
228 N. LaSalle St., Chicago, 1

Thomas Alabama Kaolin Co. (Tako)
2412 Ken Oak Rd., Baltimore 9, Md.

United Clay Mines Corp.
Trenton 6, N. J.
(Dilex, Barnett, Franklin)

Vanderbilt Co., R. T.
230 Park Ave., New York, 17
(Pyrax, Continental)

Whittaker, Clark & Daniels, Inc.
260 West Broadway, New York, 7

Zonolite Co. (Terralite)
1827 Benson St., Evanston, Ill.

DISINFECTANTS, SEED — See Fungicides

DRUMS (Fibre)

Bennett Industries
122 N. Washington St., Peotone, Ill.

Benson Fibre Drum Co.
186 Van Dyk St., Bklyn.

Buffalo-Carpenter Container Corp.
P. O. Box 518, Niagara Falls, N. Y.

Carpenter Container Corp.
147 41st St., Brooklyn 32

Continental Can Co.
100 E. 42nd St., N. Y. 17

Emery-Carpenter Container Co.
Carew Tower, Cincinnati

Federal Fibre Corp.
3704 10th St., L. I. C., N. Y.

Fibre Drum Co.
20 N. Wacker Dr., Chicago 6

Master Package Corp.
Owen, Wisc.

Monmouth Container Corp.
Matawan, N. J.

Plyfiber Container Corp.
650 South Ave., Garwood, N. J.

Rheem Mfg. Co.
1701 Edgar Rd., W., Linden, N. J.

Seymour & Peck Co.
Blue Island, Ill.

Virginia Barrel Co.
P. O. Box 86, Staten Island, N. Y.

DRUMS (Metal)

Bennett Industries
122 N. Washington St., Peotone, Ill.

Continental Can Co.
100 E. 42nd St. N. Y. 17

Eastern Steel Barrel Corp.
3021 Lincoln Blvd., Bound Brook, N. J.

Florida Drum Co.
208 E. Liberty St., Pensacola. Fla.

Geuder, Paeschke & Frey Co.
324 N. 15 St., Milwaukee

Inland Steel Container Co.
30 W. Monroe, Chicago

Jones & Laughlin Steel Corp.
3 Gateway Center, Pittsburgh

Manion Steel Barrel Co.
Rouseville, Pa.

Myers Drum Co.
6549 San Pablo Ave., Oakland, Calif.

National Steel Container Corp.
Chicago 38

Nesco, Inc.
270 N. 12th St., Milwaukee 1

Ohio Corrugating Co.
Warren, O.

Reliable Steel Drum Co.
808 Union Ave., Bridgeport, Conn.

Republic Steel Corp.
Republic Bldg., Cleveland 11

Rheem Mfg. Co.
1701 Edgar Rd., W., Linden, N. J.

Southern States Containers
2830 5th Ave., North, Birmingham, Ala.

U. S. Steel Prods. Co.
30 Rock Plaza, N. Y. 20

United States Barrel Co.
225 S. 15th St., Phila. 2

Vulcan Containers, Inc.
Bellwood, Ill.

Vulcan Steel Container Co.
3315 N. 35th Ave., Birmingham, Ala.
See advertisement on page 67A

Wheeling Steel Corp.
Wheeling, W. Va.

DRUM HANDLER

Specialty Machinery Corp.
50 Roanoke Ave., Newark 5, N. J.

DRYERS — COOLERS

Davidson-Kennedy Co.
Box 97, Station D, Atlanta

General American Transportation Corp.
Louisville, Ky.

Hardinge Co.
York, Pa.

Kennedy-Van Saun Mfg. & Eng'g Corp.
405 Park Ave., N. Y. 22

Link Belt Co.
Prudential Plaza, Chicago 1

McDermott Bro. Co.
Washington & 3rd, Allentown, Pa.

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24
See advertisement on page 121

Standard Steel Corp.
P. O. Box 58252, Los Angeles 58

DUST COLLECTORS

Day Co.
810 3rd Ave. N. E., Minneapolis

Davidson Kennedy Co.
Box 97, Station D, Atlanta

Dustex Corp.
1758 Waldemere St., Buffalo, N. Y.

Fertilizer Engineering & Equip. Co.
Memorial Drive, Green Bay, Wisc.

Joy Manufacturing Co.
401 Oliver Bldg., Pittsburgh

Omega Div., BIF Industries, Inc.
538 Harris Ave., Providence 1, R. I.

Edw. Renneburg & Sons Co.
2639 Boston St., Baltimore 24
See advertisement on page 121

A. J. Sackett & Sons Co.
1737 S. Highland Ave., Baltimore

Wheelabrator Corp.
Mishawaka, Ind.

DUST MASKS — See Masks

ELEVATORS

Beaumont Birch Co.
1505 Race St., Philadelphia 2

Chain Belt Co.
4795 W. Greenfield Ave., Milwaukee 1

Davidson Kennedy Co.
Box 97, Station D, Atlanta

Kennedy-Van Saun Mfg. & Engr. Corp.
405 Park Ave., New York

New London Engineering Co.
New London, Wisc.

Link Belt Co.
Prudential Plaza, Chicago 1

Sturtevant Mill Co.
123 Clayton St., Boston 22
See advertisement on page 131

EMULSIFIERS

Armour Chem. Div.
1355 W. 31 St., Chicago 9, Ill.

Atlas Powder Co., Chemicals Div.
Wilmington 99, Del.
(Atlox)

Antara Chemicals Div.,
General Aniline & Film Corp.
435 Hudson St., New York 14
(Antarite)

National Aniline Div.,
Allied Chem. Corp.
40 Rector St., New York
See advertisement on page 12

Nopco Chemical Co.
60 Park Pl., Newark, N. J.
(Agrimuls)

Process Chemical Co.
8733 S. Dice St., Los Nietos, Calif.

Theodore Riedeburg Associates
415 Lexington Ave., N. Y. 17
See advertisement on page 139

Rohm & Haas Co.
222 W. Washington Sq., Philadelphia
(Tritons)

L. Sonneborn Sons, Inc.
300 Fourth Ave., New York 10

Stepan Chemical Co.
427 W. Randolph St., Chicago 6
(Toximuls)

Sole Chemical Corp.
27 E. Monroe St., Chicago 3
(Sole, Mulse)

Thompson-Hayward Chemical Co.
2915 Southwest Blvd.
Kansas City, Mo.
See advertisement on page 62

Witco Chemical Co.
122 E. 42nd St., New York 7
(Emulsol)

ENDRIN — See Insecticides

ENGINEERS — See Fertilizer Plants

FEED SUPPLEMENTS — See Animal Feed Supplements

FEEDERS

Davidson Kennedy Co.
P. O. Box 97, Station D, Atlanta

Hardinge Co.
240 Arch St., York, Pa.

C. S. Johnson Co., Div. Koering Co.
Champaign, Ill.

Kennedy-VanSaun Mfg. & Engr. Corp.
405 Park Ave., New York

Omega Machine Co., Div. BIF Industries
345 Harris Ave., Providence 1, R. I.

Pulva Corp.
505 High St., Perth Amboy, N. J.

A. J. Sackett & Sons
1737 S. Highland Ave., Baltimore

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

Syntron Co.
579 Lexington Ave., Homer City, Pa.

Weighing & Control Components, Inc.
206-P Lincoln Ave., Hatboro, Pa.

FERTILIZER PLANTS (Design, Engineering and Construction)

Barnard & Leas Mfg. Co.
1234 12th St., S.W., Cedar Rapids, Ia.
See advertisement on page 123

Blaw Knox Co.
300 6th St., Pittburgh 22, Pa.

FERTILIZER PLANTS (Cont.)

Blue Valley Equipment Mfg. & Engineering Co.
Laurent & N. Taylor Sts., Topeka, Kans.

Butler Mfg. Co.
7400 E. 13th St., Kansas City 26

Chemical Construction Corp.
525 W. 43rd St., N. Y. 36

Chemical & Industrial Corp.
Cincinnati, Ohio

Davidson-Kennedy Co.
1090 Jefferson SW, Atlanta, Ga.

Dorr-Oliver, Inc.
Stamford, Conn.

Fertilizer Eng'g & Equipment Co.
Memorial Drive, Green Bay, Wisc.

Fluor Corp., Ltd.
2500 S. Atlantic St., Los Angeles 22

Foster Wheeler Corp.
666 5th Ave., New York

General Industrial Development Corp.
270 Park Ave., N. Y. 17
Agents for St. Gobain Process for manufacture of nitrophosphate fertilizers

Girdler Corp.
Louisville, Ky.

M. W. Kellogg Co.
711 Third Ave., New York

Leonard Construction Co.
37 S. Wabash Ave., Chicago 3, Ill.

Longhorn Construction Co.
P. O. Box 336, Sulphur Springs, Tex.

Lummus Co.
385 Madison Ave., N. Y. 17

Luria Engineering Co.
511 5th Ave., New York

Manitowac Shipbuilding, Inc.
Manitowac, Wisc.

F. H. McGraw
51 E. 42nd St., New York

Midstates Machinery
359 E. Main St., Decatur, Ill.

Robert F. McCloskey Engineering Co.
Highland Bldg., E. Liberty, Pa.

Poulsen Co.
2341 8th St., Los Angeles 21
See advertisement on page 101

A. J. Sackett & Sons
1737 S. Highland St., Baltimore

Saumico Engineering Co.
Saumico, Wisconsin

Standard Steel Mfg. Co.
2137 N. Sherman Dr., Indianapolis

Titlestad Corp.
521 Fifth Ave., New York

Vulcan Engineering
120 Syeamore, Cincinnati

D. M. Weatherly Co.
80 Eleventh St., Atlanta, Georgia

Whiting-Turner Contracting Co.
6229 Charles St., Baltimore 12

FLUORIDES — See Insecticides

FORMULATORS — See Insecticide Formulators

FRONT END LOADERS — See Tractor Shovels

FUMIGANTS (For stored grain, etc.)

American Cyanamid Co.
30 Rockefeller Plaza, New York

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14

Dow Chemical Co.
Midland, Mich.

Frontier Chemical Co.
Div. Vulcan Materials Co.
Wichita 1, Kans.

Great Lakes Chemical Corp.
500 Fifth Ave., New York 36

Kolker Chemical Corp.
600 Doremus Ave., Newark 5, N. J.

Michigan Chemical Corp.
St. Louis, Mich.

Shell Chemical Corp.
50 W. 50th St., New York
See advertisement on page 68A

FUMIGANTS, SOIL — See Nematocides

FUMIGATION TARPAULINS — See Tarpaulins

FUNGICIDES

American Cyanamid Co.
30 Rockefeller Plaza, New York
(Cyprex)

Berkshire Chemicals, Inc.
420 Lexington Ave., N. Y. 17
(Dithiocarbamates, Mercury Cmpds.)
See advertisement on page 114

California Spray Chemical Corp.
Richmond, Calif.
(Phaltan)

Calumet Div., Calumet & Hecla, Inc.
9 Calumet Ave., Calumet, Mich.
(Fungicide Grade Copper Oxide)

Carbide & Carbon Chemicals Div., Union Carbide Corp.
30 E. 42nd St., New York 17
(Glyodin)

Chemagro Corp.
437 Fifth Ave., New York
(Dyrene, Chlorthion)

Chemical Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.
(Chem-Bam)

W. A. Cleary Corp.
P.O. Box 749, New Brunswick, N. J.
(Phenyl Mercury Acetate)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(Hexachlorobenzene, seed protectant)

Dow Chemical Co.
Midland, Mich.
(Dowicides)

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(Ceresan, Delsan, Thylate)

Faesy & Besthoff, Inc.
25 E. 26 St., New York 10
(Copper Sulfate)

Frontier Chemical Co., Div. Vulcan Matl.
Wichita 1, Kansas
(Pentachlorophenol)

Gallowhur Chemical Corp.
N. Water St., Ossining, N. Y.
(Organo-Mercury Compounds)

Irvington Smelting & Refining Co.
374 Nye Ave., Irvington, N. J.

Kalo Inoculant Co.
525 Kentucky St., Quincy, Ill.
(Seed Treatment)

Metal & Thermit Co.
Rahway, N. J.

Metalsalts Corp.
200 Wagrow Rd., Hawthorne, N. J.
(Mercury Compounds)

Merck & Co.
Rahway, N. J.
(Antibiotics)

Mallinckrodt Chemical Works
3600 Second St., St. Louis
(Mercury Compounds)

Miller Chemical & Fertilizer Corp.
Baltimore 15, Md.
(Copper-Zinc-Chromate Complex)

Monsanto Chemical Co.
St. Louis, Mo.
(Ortho nitro chlorobenzene, Pentachlorophenol)

Nationwide Chemical Co.
P. O. Box 775, Fort Myers, Fla.
(Nabac-25)

Naugatuck Chemical Div.
U. S. Rubber Co.
Naugatuck, Conn.
(Phygon, Spergon)

Niagara Chemical Div.
Food Machinery & Chem. Corp.
Middleport, N. Y.
(Nabam, Niacide)
See advertisement on page 19

Olin-Mathieson Chem. Corp.
10 Light St., Baltimore 3
(Terraclor, Omazene)

Phelps Dodge Refining Corp.
300 Park Ave., New York 22
("Triangle Brand" Copper Sulphate)
See advertisement on page 6

Chase Pfizer & Co.
630 Flushing Ave., Brooklyn, N. Y.
(Antibiotics)

Refined Products Corp.
Lyndhurst, N. J.
(Perma-cides)

Republic Chemical Corp.
94 Beekman St., New York 38
Copper Sulphate)

Roberts Chemicals, Inc.
Nitro, W. Va.
(Amobam)

Robertson Co., H. H.
2434 Farmers Bank Bldg., Pittsburgh 22

Rohm & Haas, Inc.
Washington Sq., Philadelphia 5
(Dithane, Karathane)

Tennessee Corp.
617 Grant Bldg., Atlanta
(Tri-Basic Copper Sulphate)
See advertisement on page 15

FUNGICIDES (Cont.)

R. T. Vanderbilt Co.
230 Park Ave., New York 17
(Vancide)
See advertisement on page 117

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Emmi)

FURNACES — See Refractories

GAS MASKS — See Masks

GIBBERELLIC ACID — See Plant Growth Regulators

GLOVES — See Masks

GOGGLES — See Masks

GRANULATORS — See Ammoniators

GRINDERS — See Mixers

HEPTACHLOR — See Insecticides

HERBICIDES

Amchem Products Inc.
Ambler, Pa.
(2,4-D, 2,4,5-T, Amoben, Amitrol, Dinoben, Fenac)

American Smelting & Refining Co.
120 Broadway, New York 5
(Arsenates)

Berkeley Chemical Corp.
Summit Avenue, Berkeley Heights, N. J.

Chemagro Corp.
437 Fifth Ave., New York
(DEF)

Chipman Chemical Co.
Bound Brook, N. J.
(Arsenicals)

Carbide & Carbon Chemicals Div., Union Carbide Corp.
30 E. 42nd St., New York 17
(Sesone)

Chemical Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.
(Sodium Arsenite, Aquatic Herbicide, 2,4-D)

Columbia-Southern Chemical Corp.
632 Fort Duquesne Blvd., Pittsburgh 22
(Chloro-IPC)

Dow Chemical Co.
Midland, Mich.
(2, 4-D, 2,4,5-T, Forron)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(2,4-D, 2,4,5-T)

Eastman Chemical Products, Inc.
Kingsport, Tenn.
(2-ethyl hexoic acid, 2-ethyl hexyl acid, and 2-ethyl iso hexyl acid—Intermediates for production of herbicides)
See advertisement on page 26

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(Karmex, Kloben, Telvar, Trysben)

General Chemical Div., Allied Chemical Corp.
40 Rector St., New York 6
(Calcium Arsenate Granular, HCA)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Atrazine, Simazine)
See advertisement on page 16

Heyden-Newport Chem. Corp.
342 Madison Ave., New York
(Trichlorobenzoic Acid)

Hooker Chemical Corp.
606 Buffalo Ave., Niagara Falls, N. Y.
(Sodium Chlorate)

Monsanto Chemical Co.
St. Louis 24, Mo.
(Randox, Vegadex)

Naugatuck Chem. Div. U. S. Rubber Co.
Naugatuck, Conn.
(Alanap, Falone)

Pennsalt Chemicals Corp.
Tacoma, Wash.
(Endothal)
See advertisement on page 52

Reade Mfg. Co.
135 Hoboken Ave., Jersey City 2, N. J.

Reasor-Hill Corp.
Box 36, Jacksonville, Ark.
(Aquatic Herbicide)

Roberts Chemicals, Inc.
Nitro, W. Va.
(Herbisan 5)

Shell Chemical Corp.
460 Park Ave., New York 22
(Aqualin, aquatic herbicide)
See advertisement on page 68A

Standard Agricultural Chemicals, Inc.
1301 Jefferson St., Hoboken, N. J.
(Sinox PE, dinitro)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Eptam)
See advertisement on page 61

Thompson-Hayward Chemical Co.
2915 Southwest Blvd., Kansas City, 8
(2,4-D and 2,4,5-T)

U. S. Borax & Chem. Corp., Pacific Coast Borax Co. Div.
630 Shatto Pl., Los Angeles 5
(Ureabor, Polybor-chlorate, Borascu)

Virginia-Carolina Chemical Corp.
Richmond, Va.
(V-C Folex, cotton defoliant)

HORMONES — See Plant Growth Regulators

INSECTICIDE FORMULATORS (manufacturers of finished pesticides for sale in bulk

Acock Laboratories,
2700 E. 5th St., Austin, Tex.

Agricultural Chemicals, Inc.
Walnut Grove, Calif.

Agricultural Chemicals, Inc.
Llano, Texas

Agricultural Chemical Service Co.
Montgomery, Ala.

California Spray-Chemical Corp.
Richmond, Calif.

Carolina Chemicals, Inc.
P. O. Box 138, West Columbia, S. Car.

Central Chem. Co.
49 N. Jonathan St., Hagerstown, Md.

Chapman Chem. Co.
38 Court St., Memphis, Tenn.

INSECTICIDE FORMULATORS (Cont.)

Chem. Insecticide Corp.
30 Whitman Ave., Metuchen, N. J.

Chipman Chem. Co.
Bound Brook, N. J.

William Cooper & Nephews,
1909 Clifton St., Chicago

Corona Chemical Div.
Pittsburgh Plate Glass Co.
Pittsburgh, Pa.

Douglas Chem. Co.
620 E. 16th Ave., N. Kansas City, Mo.

Durham Chem. Co.
4124 E. Pacific Way, Los Angeles

Faisy & Besthoff, Inc.
26 East 26th St., New York 10

Flag Sulphur & Chem. Co.
Tampa, Fla.

Florida Agricultural Supply Co.
Box 658, Jacksonville, Fla.

Fresno Agricultural Chem. Co.
Fresno, Calif.

Georgia-Carolina Oil Co.
1403 Sixth St., Macon, Ga.

Hayes-Sammons Co.
Mission, Texas

Howerton Gowen Co.
East 11th St., Roanoke Rapids, N. C.

Kwik-Way Chem. Co.
Box 2536, San Antonio, Texas

O. E. Linck Co.
Route 6 & Valley Rd., Clifton, N. J.

C. J. Martin & Sons
413 Chicon St., Austin, Texas

Millmaster Cem. Corp.
295 Madison Ave., New York 17

Naco Fertilizer Co.
Box 858, Charleston, S. C.

Oregon Agricultural Chemicals,
Tulelake, Oreg.

W. R. Peele Co.
516 S. Salisbury St., Raleigh, N. C.

Phoenix Chem. Co.
19th Ave. & Roosevelt, Phoenix, Ariz.

Plainsman Supply Co.
Plainview, Texas

Planters Chemical Corp.
3111 Virginia Beach Blvd., Norfolk, Va.

Port Fertilizer & Chem. Co.
Los Fresno, Tex.

Private Brands, Inc.
300 S. 3rd St., Kansas City, Kan.

Quality Chemical Corp.
Box 564, Memorial Ave., Greenville,
N. C.

Ralston Purina Co.
835 S. 8th St., St. Louis

Reasor-Hill Corp.
Jacksonville, Ark.

Riverdale Chemical Co.
Chicago Heights, Ill.

Southwest Co-operative Wholesale
1821 E. Jackson St., Phoenix, Ariz.

Taylor Chemical Co.
Aberdeen, N. C.

Thompson-Hayward Chemical Co.
2915 S. W. Blvd., Kansas City
See advertisement on page 42

Tyner-Petrus Co.
100 Trenton St., West Monroe, La.

F. H. Vahlsing
Elsa, Texas

Woolfolk Chemical Works
Fort Valley, Ga.

INSECTICIDES, TECHNICAL (Concentrates and basic raw materials for use in the manufacture of finished formulations) including Arsenicals, Chlorinated Hydrocarbons and Phosphates

American Cyanamid Co.
30 Rockefeller Plaza, N. Y.
(Parathion, Dicapthon, Malathion)

American Smelting & Refining Co.
120 Broadway, New York 5
(Arsenates)

Carbide & Carbon Chemicals Div.,
Union Carbide Corp.
30 E. 42nd St., New York 17
(Sevin)

Chemagro Corp.
437 5th Ave., New York
(Parathion, Methyl Parathion)

Chipman Chemical Co.
Bound Brook, N. J.
(Arsenates)

W. A. Cleary Corp.
P. O. Box 749, New Brunswick, N. J.
(Arsenates)

Diamond Alkali Co.
300 Union Commerce Bldg., Cleveland
(BHC, Lindane, DDT, TEPP)
See advertisement on page 18

E. I. du Pont de Nemours & Co.
Wilmington, Del.
(Methoxychlor)

Durham Chemical Co.
4124 E. Pacific Way, Los Angeles 23
(DDT, Parathion)

Eastman Chemical Products, Inc.
Kingsport, Tenn.
(Triethyl Phosphate—intermediate
for TEPP)
See advertisement on page 26

Flag Sulphur & Chem. Co.
P. O. Box 5737, Tampa 5, Fla.
(DDT, Parathion, Malathion)

Frontier Chemical Co., Div. Vulcan
Materials Co.
Wichita 1, Kans.
(BHC)

General Chem. Div., Allied Chem. Corp.
40 Rector St., New York 6
(BHC, DDT, TDE)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Methoxychlor, DDT, Diazinon)

R. W. Greeff & Co.
10 Rockefeller Plaza, New York 20
(DDT, DDVP)

Hercules Powder Co.
900 Market St., Wilmington, 99, Del.
(Toxaphene, Thanite, Delnav)

Lebanon Chemical Co.
Lebanon, Pa.
(DDT)

INSECTICIDES, Technical (Cont.)

Michlin Chemical
9045 Vincent St., Detroit. Mich.
(DDT)

Monsanto Chemical Co.
St. Louis, Mo.
(Parathion, Methyl Parathion)

Niagara Chemical Div., FMC
Middleport, N. Y.
(BHC, DDT, Lindane, TEPP, Thiodan, Ethion, Phostex, Tedion)

Olin-Mathieson Chemical Corp.
10 Light St., Baltimore
(DDT, BHC)

S. B. Penick & Co.
100 Church St., New York 7
(Chlordane, Lindane, DDT, Malathion)

Pennsalt Chemicals Corp.
Tacoma, Wash.
(BHC, DDT, Lindane, Malathion)

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1
(Chlordane, DDT, Lindane, Malathion)

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Perthane, Rhothane, Lethane)

Shell Chemical Corp.
460 Park Ave., New York 22
(Aldrin, Dieldrin, Endrin, Phosdrin. Methyl Parathion)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Parathion, Trithion, DDT, Aramite)

United-Heckathorn Co.
600 S. 4th St., Richmond, Calif.
(DDT, Cryolite)

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Chlordane, Heptachlor, Parathion, Methyl Parathion)

Victor Chemical Works
Box 572, Chicago 90
(Methyl Parathion)

INSECTICIDES, BOTANICAL (Pyrethrum, Rotenone, Allethrin, Cube, Derris, Ryania, Sabadilla, etc.)

Chemical Insecticide Corp
30 Whitman Ave., Metuchen, N. J.

Fairfield Chemical, Div., FMC
441 Lexington Ave., New York 17

McLaughlin Gormley King Co.
1715 S. E. 5th St., Minneapolis

S. B. Penick & Co.
100 Church St., New York

Prentiss Drug & Chem. Co.
101 West 31st St., New York 1

INSECTICIDES, MICROBIAL

Bioferm Corp.
Wasco, Calif.
(Thuricide)

Merck & Co. (Bacillus Thuringiensis)
Rahway, N. J.

INSECTICIDES (Trade or Common Name Products)

Aldrin
Shell Chemical Corp.
460 Park Ave., New York 22

Aramite
Naugatuck Chemical Div.,
U. S. Rubber Co.
Naugatuck, Conn.

Chlorobenzilate
Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley. N. Y.
See advertisement on page 16

Co-Ral
Chemagro Corp.
437 Fifth Ave., New York

Delnav
Hercules Powder Co.
900 Market St., Wilmington 99, Dela.
See advertisement on page 8

Diazinon
Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
See advertisement on page 16

Dicapthon
American Cyanamid Co.
30 Rockefeller Plaza, New York

Dieldrin
Shell Chemical Corp.
460 Park Ave., Uew York 22

Dipterex, Dylox
Chemagro Corp.
437 Fifth Ave., New York

Dri-Die
Davison Chemical Div., W. R. Grace & Co.
Baltimore 3, Md.

Endrin
Shell Chemical Corp.
460 Park Ave., New York 22

Ethion
Niagara Chemical Div., Food Machinery & Chem. Corp.
Middleport, N. Y.

Guthion
Chemagro Corp.
437 Fifth Ave., New York

Heptachlor
Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11

Kelthane, Lethane
Rohm & Haas Co.
Washington Sq., Phila. 5

Malathion
American Cyanamid Co.
30 Rockefeller Plaza, New York

OMPA. (Sytam)
Pennsalt Chemicals Corp.
Tacoma, Wash.

Perthane
Rohm & Haas Co.
Washington Sq., Philadelphia 5

Phosdrin
Shell Chemical Corp.
460 Park Ave., New York 22

Phosphamidon
California Spray Chem. Corp.
Richmond, Calif.

Phostex
Niagara Chemicals Div., FMC
Middleport, N. Y.

Pyrenone
Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17

Rhothane
Rohm & Haas Co.
Washington Sq., Phila. 5

Sevin
Carbide & Carbon Chemicals Div.,
Union Carbide Corp.
30 E. 42nd St., New York 17

Silikil
United Heckathorn
6008 4th St., Richmond, Calif.

Strobane
Heyden Newport
342 Madison Ave., New York

Systox
Chemagro Corp.
437 Fifth Ave., New York

Sytam
Pennsalt Chemicals Corp.
Tacoma, Wash.

Tedion, Thiodan
Niagara Chemical Div., FMC
Middleport, N. Y.

TDE
General Chemical Div.
Allied Chemical Corp.
40 Rector St., New York 6

Thimet
American Cyanamid Co.
30 Rockefeller Plaza, New York

Thiram
Pennsalt Chemicals Corp.
Tacoma, Wash.

Thanite, Toxaphene,
Hercules Powder Co.
900 Market St., Wilmington 99, Del.
See advertisement on page 8

Trithion
Stauffer Chemical Co.
380 Madison Ave., New York 17

Trolene
Dow Chemical Co.
Midland, Mich.

LABEL AND PACKAGE DESIGN

Cameo Die & Label Co.
154 W. 14th Street, New York 11 N. Y.

Richard de Bang Co.
826 Seventh Avenue, New York 17

Donrico Inc.
438 West 37th Street, New York 18

Walter Frank Organization
4100 Warren Avenue, Hillside, Ill.

Donald Palmer, Inc.
2627 Tchoupitoulas St., New Orleans

A. H. Wirz, Inc.
Fourth & Townsend Sts., Chester, Pa.

LABELERS

Burt Machine Co.
401 E. Oliver Street, Baltimore 2, Md.

Industrial Marking Equipment Co.
454 Baltic St., Brooklyn 17

Labelette Co.
2611 D. Leland Ave., Chicago 25, Ill.

Potdevin Machine Co.
200 North Street, Teterboro, N. J.

Standard-Knapp Division,
Emhart Manufacturing Co.
Main Street, Portland, Conn.

LABORATORY APPARATUS AND EQUIPMENT

Analytical Measurements, Inc.
585 Main St., Chatham, N. J.
(pH meter)
See advertisement on page 133

Beckman Instruments, Inc.
2500 Fullerton Rd., Fullerton, Calif.

Burrell Corp.
2223 Fifth Ave., Pittsburgh

Cargille Scientific, Inc.
117 Liberty St., N. Y. 6

Central Scientific Co.
1700 W. Irving Pk., Chicago

Eimer & Amend
633 Greenwich St., New York, N. Y.

Fisher Scientific Co.
717 Forbes St., Pittsburgh

Emil Greiner Co.
161 Avenue of Americas, N. Y.

Harshaw Chemical Co., Scientific Div.
Hastings-on-Hudson, N .Y.

Kensington Scientific Corp.
99 Rincon Rd., Berkeley 7, Calif.

Kimble Glass Co.
Toledo 1, O.

Labline, Inc.
3070 W. Grand St., Chicago
(Rooms for plant & soil study)

Laboratory Furniture Co.
Mineola, L. I., New York

Laboratory Construction Co.
111 Holmes St., Kansas City, Mo.

Soiltest, Inc.
60 E. 42nd St., New York, N. Y.

Standard Scientific Supply Corp.
808 Broadway, New York 3

Arthur H. Thomas Co.
Vine St. at 3rd., Phila.

Will Corp.
Rochester, N. Y.

LABORATORY CHEMICALS (Reagents)

J. T. Baker Chemical Co.
Phillipsburg, N. J.

Fine Organics, Inc.
205 Main St., Lodi, N. J.

Fisher Scientific Co.
717 Forbes St., Pittsburgh

General Chemical Div.
40 Rector St., N. Y.

Harshaw Chemical Co.
1945 E. 97th St., Cleveland

Mallinckrodt Chemical Works
3600 N. 2nd St., St. Louis

Merck & Co.
Rahway ,N. J.

Arthur H. Thomas Co.
Vine St., at 3rd., Phila.

LEAD ARSENATE — See Insecticides

LIME

American Limestone Co.
Knoxville, Tenn.

Ashcraft Wilkinson Co.
Atlanta Ga.

Dolcito Quarry Co.
Birmingham, Ala.

Marble Products Co. of Georgia
First National Bank Bldg., Atlanta 3,

Moores Lime Co.
Springfield, O.

National Lime & Stone Co.
Findlay, Ohio

West End Chemical Co.
1956 Webster, Oakland 12, Calif.

Willingham-Little Stone Co.
Fulton National Bank Bldg., Atlanta 3,

This Buyers' Guide is designed for year-round use.

DON'T FILE IT!

Keep handy on your desk, for daily reference.

AGRICULTURAL CHEMICALS
Box 31, Caldwell, N. J.

LINDANE — See Insecticides

LIQUID FERTILIZER PLANTS

Barnard & Leas Mfg. Co.
1202 Twelfth St., Cedar Rapids, Ia.

LOADERS — See Tractor Shovels

MAGNESIUM PRODUCTS — See also Trace Elements

Berkshire Chemicals Inc.
630 Third Ave., New York 17, N. Y.
(magnesium, magnesia, magnesium oxide, magnesium sulfate)

MALATHION — See Insecticides

MALEIC HYDRAZIDE — See Plant Growth Regulators

MASKS (Dust Masks, Gas Masks, Goggles, Respirators, etc.)

Acme Protection Equipment Co.
1201 Kalamazoo St., S. Haven, Mich.

American Optical Co.
Mechanics St., Southbridge, Mass.

Bausch & Lomb Optical Co.
Rochester 2, N. Y.

Chicago Eye Shield Co.
2727 W. Roscoe, Chicago, 35

Flexo Products, Inc.
Westlake, Ohio

Hub States Chemicals & Equipment
1255 Windsor St., Indianapolis, Ind.

Martindale Electric Co.
1367 Hird Ave., Cleveland 7, Ohio

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8

Pulmosan Safety Equipment Corp.
644 Pacific St., Brooklyn 17

Willson Products Div., Ray-O-Vac Co.
116 Thorn St., Reading, Pa.

MAGNETIC SEPARATORS — See Separators, Magnetic

METAL CHELATES — See Chelating Agents

METERS AND GAUGES

Analytical Measurements
585 Main St., Chatham, N. J.
(pH meters)

Badger Meter Mfg. Co.
4545 W. Brown Deer Rd., Milwaukee

Bin-Dicator Co.
13946 Kercheval Ave., Detroit
(Indicators, controls, switches)

Bowser, Inc.
1398 E. Creighton Ave., Ft. Wayne, Ind.

Buffalo Meter Co.
2935 Main St., Buffalo 14

Fisher & Porter Co.
1139 County Line Rd., Hatboro, Pa.

Foxboro Co.
Foxboro, Mass.

Marsh Instrument Co.
Skokie, Ill.

Neptune Meter Co.
19 W. 50th St., New York

Schaffer Poidometer Co.
2828 Smallman St., Pittsburgh 22

Squibb Taylor Co.
1213 S. Akard St., Dallas

METHOXYCHLOR — See Insecticides

METHYL PARATHION — See Insecticides

MINERALS, TRACE — See Trace Elements

MINOR ELEMENTS — See Trace Elements

MILLS (for pesticide grinding)

Combustion Engineering Co.,
Raymond Div.
1114 W. Blackhawk St., Chicago 22

Fluid Energy Processing & Equipt. Co.
Richmond & Norris Sts. ,Phila. 25

Munson Mill Machinery Co.
210 Seward Ave., Utica, N. Y.

Pulverizing Machinery Co.
63 Chatham Rd., Summit, N. J.

Sturtevant Mill Co.
123 Clayton St., Boston 22

Williams Patent Crusher & Pulverizer Co.
813 Montgomery St., St. Louis

MILLS (for fertilizer grinding)

Abbe Engineering Co.
420 Lexington Ave., N. Y. 17

Atlanta Utility Works
East Point, Ga.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Bradley Pulverizer Co.
Allentown, Pa.

Combustion Engineering
Raymond Pulverizer Div.
1114 W. Blackhawk St., Chicago 22

Davidson-Kennedy Co.
1090 Jefferson St., N. W., Atlanta

Delta Mfg. Co.
603 Badgerow Bld., Sioux City, Ia.

Fertilizer Engr. & Equip. Co.
Memorial Drive, Green Bay, Wis.

Gruendler Crusher & Pulverizer Co.
2920 N. Market St., St. Louis

Hardinge Co.
York, Pa.

Inglett & Co.
Box 3425, Augusta, Ga.

MILLS FOR FERTILIZER GRINTING (Cont.)

Kennedy-Van Saun Mfg. & Engr. Corp.
405 Park Ave., New York 22

Longhorn Construction Co.
Sulphur Springs, Tex.

Edw. Renneburg & Sons
2639 Boston St., Baltimore 24
See advertisement on page 121

A. J. Sackett & Sons
1701 S. Highland Ave., Baltimore

Sturtevant Mill Co.
123 Clayton St., Boston 22

William Patent Crusher & Pulverizer Co.
813 Montgomery St., St. Louis, Mo.

MIXERS — BLENDERS (Automatic, Batch)

Atlanta Utility Works (Batch)
East Point, Ga.

Andrews Machine Co.
Decatur, Ill.

Barnard & Leas Mfg. Co.
1234 12th St., S.W., Cedar Rapids, Ia.
See advertisement on page 123

Brower Manufacturing Co.
411 N. 3rd St., Quincy, Ill.

Combustion Engineering Co.
Raymond Pulverizer Div.
1114 W. Blackhawk St., Chicago 22

Conn. & Co.
9 S. Marion St., Warren, Pa.

Continental Gin Co. (Batch)
Birmingham, Ala.

Craddock Equipment Co.
1507 A. St., Wilmington, Del.

J. H. Day Co.
Cincinnati 12

Davidson-Kennedy Co.
1090 Jefferson, SW, Atlanta, Ga.

Delta Manufacturing Co.
603 Badgerow Bldg., Sioux City, Ia.

Eastern Industries Inc.
Hamden 14, Conn.

Falcon Manufacturing Div.,
First Machinery Corp.
211 Tenth St., Brooklyn 15

Gifford-Wood Co.
420 Lexington Ave., New York

B. F. Gump Co.
1338 S. Cicero Ave., Chicago

Industrial Process Engineers
8 Lister Ave., Newark, N. J.

Intl. Eng. Co.
1145 Bolander St., Dayton 1, O.

C. S. Johnson Co.
Champaign, Ill.

Link Belt Co.
307 N. Michigan Ave., Chicago 1

Mixing Equipment Co.
185-N Mt. Read Blvd., Rochester, N .Y.

Munson Mill Machinery Co.
210 Seward Ave., Utica, N. Y.

Paterson-Kelley Co.
East Stroudsburg, Pa.

A. E. Poulsen Co.
2341 E. 8th St., Los Angeles 21

Prater Pulverizer Co.
1829 S. 55th Ave., Chicago

Rapids Machinery Co.
Marion, Ia.

Read Standard Division
York, Pa.

George C. Rodgers Co., Inc.
2401 Third Ave., New York, 51

Sprout, Waldron & Co.
7 Logan St., Muncy, Pa.

Schutz-O'Neil Co.
311 Portland Ave., Minneapolis 15, Minn.

Scottdel, Inc.
Swanton, O.

Stedman Foundry & Machine Co.
Aurora, Ind.

Sturtevant Mill Co.
123 Clayton St., Boston 22

Young Machinery Co.
Muncy, Pa.

Worthington Corp.
S. Second St., Plainfield, N.J.

MITICIDES

California Spray Chemical Co.
Richmond, Calif.
(Mitox, Phosphamidon)

Chemagro Corp.
437 Fifth Ave., New York
(Guthion)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(Ovex)

Geigy Agricultural Chemicals
Saw Mill River Rd., Ardsley, N. Y.
(Chlorobenzilate)
See advertisement on page 16

Hercules Powder Co.
900 Market St., Wilmington 99
(Delnav)
See advertisement on page 8

Niagara Chemical Div., FMC
Middleport, N. Y.
(Tedion, Ethion, Phostex)
See advertisement on page 19

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Kelthane)

Stauffer Chemical Co.
380 Madison Ave., New York 17
(Trithion)
See advertisement on page 61

NEMATOCIDES

Carbide & Carbon Chemicals Div.,
Union Carbide Corp.
30 E. 42nd St., New York 17
(Mylone)

Dow Chemical Co.
Midland, Mich.
(D-D, Dorlone, Ethylene Dibromide, Methyl Bromide)

Diamond Alkali Co.
300 Union Comm. Bldg., Cleveland, 14
(PRD)

Great Lakes Chemical Corp.
500 Fifth Ave., New York 36
(Methyl Bromide)

Kolker Chemical Corp.
600 Doremus Ave., Newark 5, N. J.
(Methyl Bromide)

Shell Chemical Corp.
460 Park Ave., New York 6
(Nemagon, D-D)
See advertisement on page 68A

Stauffer Chemical Co.
380 Madison Ave., New York, 7
(Vapam)
See advertisement on page 61

Virginia-Carolina Chemical Co.
401 E. Main St., Richmond, Va.
(V-C 13)

NITROGEN MATERIALS

LIQUIDS
Anhydrous Ammonia, and Solutions

Alabama By-Products Corp.
PO Box 354, Birmingham, Ala.
(anh. amm., N. solns.)

American Cyanamid Co.
30 Rockefeller Plaza, N. Y. 20
(anh. amm., N. solns.)
See advertisement on page 34

Armour Agricultural Chemical Co.
Atlanta, Ga.
(N. soln; anh. amm.)

Atlantic Refining Co.
260 S. Broad St., Philadelphia
(anh. amm.)

Bradley & Baker
155 E. 44th St., N. Y.
(Manufacturer's agents, importers of anh. amm., N. solns.)

Columbia Southern Chemical Corp.
Div. of Pittsburgh Plate Glass
632 Fort Duquesne Blvd., Pittsburgh 22
(anh. amm.)

Commercial Solvents Corp.
260 Madison Ave., N. Y. 16
(anh. amm., N. solns., aqua amm.)

Dow Chemical Co.
Midland, Mich.
(anh. amm.)

E. I. du Pont de Nemours & Co.
Industrial & Biochemicals Dept.
Wilmington 98, Del.
(N. solns.)

Escambia Chemical Corp.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta.
(anh. amm., N. solns.)

Grace Chemical Co.
Home Federal Bldg., Memphis
(anh. amm., amm. solns.)

Grand River Chem. Div., Deere & Co.
Pryor, Okla.
(anh. amm.)

Hercules Powder Co.
900 Market St., Wilmington, 99
(anh. amm.)

International Commodities Corp.
11 Mercer St., New York 13
(Urea, N. solutions)

Mid-South Chemical Corp.
1222 Riverside, Memphis, Tenn.

Monsanto Chemical Co.
1700 2nd St., St. Louis 24, Mo.
(anh. amm.)

Nitrogen Div., Allied Chem. & Dye Corp.
40 Rector St., N. Y. 6
(anh. amm., N. solns.)

Northern Chemical Industries, Inc.
Totman Bldg., Baltimore 2
(anh. amm., N. solns.)

Olin Mathieson Chemical Corp.
Little Rock, Ark.
(anh. amm.)

Phillips Chemical Co.
Adams Bldg., Bartlesville, Okla.
(anh. amm., N. Solns.)

Sinclair Chemicals, Inc.
600 5th Ave., N. Y., 20
(anh. amm., N. solns., aqua amm.)

Sohio Chemical Co.
PO Box 628, Lima, O.
(anh. amm., N. solns., aqua amm.)

Spencer Chemical Co.
Dwight Bldg., Kansas City 5, Mo.
(anh. amm., N. solns., aqua amm.)

Southern Nitrogen Co.
PO Box 246, Savannah, Ga.

Standard Oil Co. (Indiana)
910 S. Michigan Ave., Chicago, 5
(anh. amm., N. solns.)

Summers Fertilizer Co.
Totman Bldg., Baltimore, 2

Texas Co.
332 S. Michigan Ave., Chicago, 4
(anh. amm., N. solns., aqua amm.)

U. S. Industrial Chemicals Co.
99 Park Ave., N. Y., 16
(anh. amm., N. solns., aqua amm.)

SOLIDS — Prills, Powders

Alabama By-Products Corp.
PO Box 354, Birmingham, Ala.
(amm. sulfate)

American Cyanamid Co.
30 Rockefeller Plaza, N. Y., 20
(amm. sulfate, amm. nitrate, urea)
See advertisement on page 34

Armour Agricultural Chemical Co.
Atlanta, Ga.
(amm. nitrate)

Atkins, Kroll & Co.
417 Montgomery St., San Francisco
(urea, calcium nitrate)

H. J. Baker & Bro.
600 Fifth Av., N. Y., 20
(amm. sulfate, ca. amm. nitrate, tankage)

Bradley & Baker
155 E. 44th St., N. Y.
(Manufacturer's agents, importers of amm. sulfate, amm. nitrate, urea)

NITROGEN Materials-Solids (Cont.)

Commercial Solvents Corp.
260 Madison Ave., N. Y. 16
(amm. nitrate)

Escambia Chemical Corp.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta
(amm. nitrate)

Ford Motor Co.
3001 Miller Rd., Dearborn, Mich.
DAP (21-53-0)

Grace Chemical Co.
Home Federal Bldg., Memphis
(urea)

Grand River Chem. Div., Deere & Co.
Pryor, Okla.
(urea)

Hydrocarbon Products Co.
500 Fifth Ave., New York 18

Interlake Iron Corp.
Union Commerce Bldg., Cleveland, 14
(amm. sulfate)

International Commodities Corp.
11 Mercer St., New York, 13
(amm. sulfate, amm. nitrate)
See advertisement on page 112

International Ore & Fertilizer Corp.
500 Fifth Ave., New York 36

Koppers Co.
Pittsburgh 19
(amm. sulfate)

Lebanon Chemical Corp.
Lebanon, Pa.
(activated sludge)

Monsanto Chemical Co.
1700 S. 2nd St., St. Louis 24, Mo.
(amm. nitrate)

Nitroform Agricultural Chemical Co.
Sunnyside Ave., Woonsocket, R. I.
(ureaform)

Nitrogen Div., Allied Chem. & Dye Corp.
40 Rector St., New York, 6
(amm. sulfate, amm. nitrate, urea)

Nitrogen Products, Inc.
National Bank Bldg., New Brunswick, N. J.
(amm. sulfate)

Northern Chemical Industries, Inc.
Totman Bldg., Baltimore 2, Md.
(amm. sulfate, amm. nitrate)

Olin Mathieson Chemical Corp.
Little Rock, Ark.
(amm. sulphate, amm. nitrate, urea)

Phillips Chemical Co.
Adams Bldg., Bartlesville, Okla.
(amm. sulfate, amm. nitrate)

Republic Steel Corp.
Republic Bldg., Cleveland, 1
(amm. sulfate)

Smith-Douglass Co., Inc.
Board of Trade Bldg., Norfolk, Va.
(tankage)

Sohio Chemical Co.
PO Box 628, Lima, O.
(urea, amm. nitrate)

Spencer Chemical Co.
Dwight Bldg., Kansas City 5, Mo.
(amm. nitrate)

Southern Nitrogen Co.
PO Box 246, Savannah, Ga.
(amm. nitrate, urea)

Summers Fertilizer Co.
Totman Bldg., Baltimore 2, Md.
(amm. sulfate)

United Fertilizer Co.
Carrollville, Wisc.
(tankage)

United States Steel Corp.
525 William Penn Place, Pittsburgh 30
(amm. sulfate-granular)

U. S. Pipe & Foundry Co.
2300 First Ave. N., Birmingham 2, Ala.
(amm. sulfate)

Woodward & Dickerson, Inc.
1400 S. Penn Square, Philadelphia, 2
(Brokers—amm. sulfate, ammoniates, tankage)

NOZZLES — See Valves

PAILS; Steel — See Drums

PAN FILTER

Dorr-Oliver, Inc.
Stamford, Conn.
(vacuum filter for phosphoric acid)

PARADICHLOROBENZENE

Columbia Southern Chemical Corp.
1 Gateway Center, Pittsburgh

Dow Chemical Co.
Midland, Mich.

E. I. du Pont de Nemours & Co.
Wilmington, Del.

Hooker Chemical Corp.
603 Buffalo Ave., Niagara Falls, N. Y.

Mallinckrodt Chemical Works
3600 Second St., St. Louis

Monsanto Chemical Co.
1700 S. Second St., St. Louis

Solvay Process Div., Allied Chem. Corp.
61 Broadway, New York 6

PHENOTHIAZINE

American Cyanamid Co.
30 Rockefeller Plaza, New York

American Firstoline Corp.
Sutphin Blvd., Jamaica 35, N. Y.

Atomic Basic Chemicals Corp.
PO Box 10855, Pittsburgh, Pa.

Chemo Puro Manufacturing Corp.
Doremus Ave., Newark 5, N. J.

E. I. du Pont de Nemours Co.
Wilmington, Del.

pH METERS

Analytical Measurements, Inc.
585 Main St., Chatham, N. J.

Beckman Instruments, Inc.
2500 Fullerton Ave., Fullerton 1, Calif.

PHOSPHATE MATERIALS (phosphate rock, triple superphosphate, superphosphate)

American Agricultural Chemical Co.
100 Church St., New York 7
(rock, super)

American Cyanamid Co.
30 Rockefeller Plaza, New York 20
(rock, triple super)

Armour Agricultural Chemical Co.
Atlanta, Ga.
(rock, triple super)

H. J. Baker & Bro.
600 Fifth Avenue, New York 20
(phosphate, triple, DAP)

Bradley & Baker
155 E. 44th St., N. Y. 17
(triple, DAP)
See advertisement on page 106

Coronet Phosphate Co.,
Div. Smith Douglass Co., Inc.
Norfolk 1, Va.
(rock)

Davison Chemical Div.,
W. R. Grace & Co.
Baltimore 3, Md.
(super, triple super, rock)

Hooker Chemical Co.
Niagara Falls, N. Y.
(phosphatic solutions)

International Commodities Corp.
11 Mercer St., New York 13
(rock, triple, super)
See advertisement on page 112

International Minerals & Chemical Corp.
Skokie, Ill.
(triple, super)

PHOSPHATE MATERIALS (Cont.)

International Ore & Fertilizer Corp.
500 Fifth Ave., New York 36
(super, rock)
See advertisement on page 110

Northern Chemical Industries, Inc.
210 E. Redwood St.
Baltimore 2, Md.
(super)

Olin Mathieson Chemical Corp.
Little Rock, Ark.
(super)

Phillips Petroleum Co.
Bartlesville, Okla.
(triple super)

Planters Fertilizer & Phosphate Co.
Charleston Heights, S. C.
(super)

Swift & Co.
Bartow, Fla.
(rock, triple super)

U. S. Phosphoric Products Div., Tennessee Corp.
Box 3296, Tampa 1, Fla.
(triple super, DAP)

Western Phosphates, Inc.
distributor:
Wilson & Geo. Meyer & Co.
San Francisco
(triple super)

PHOSPHORIC ACID

American Agricultural Chemical Co.
100 Church St., New York 7

Bradley & Baker
155 E. 44 St., New York 17, N. Y.
See advertisement on page 104

Hooker Chemical Corp.
Niagara Falls, N. Y.

Davison Chemical Div., W. R. Grace Co.
Baltimore 3, Md.

A. R. Maas Chemical Co.
Div. Victor Chemical Works
4750 Ardine St., South Gate, Calif.

Monsanto Chemical Co.
St. Louis, Mo.

Olin Mathieson Chemical Corp.
Little Rock, Ark.

Shea Chemical Corp.
P. O. Box 267, Marysville, Ohio

Tennessee Corp.
619 Grant Bldg., Atlanta

U. S. Industrial Chemicals Co.
99 Park Ave., New York 16
See advertisement on page 28

U. S. Phosphoric Products Div.
Tennessee Corp.
Box 3269, Tampa 1, Fla.

Victor Chemical Works
155 N. Wacker Dr., Chicago 6

Western Phosphates Inc.
distributor:
Wilson & Geo. Meyer & Co.
San Francisco

Westvaco Mineral Products, FMC
161 E. 42nd St., New York

PLANT GROWTH REGULATORS

Abbott Laboratories
14th and Sheridan Ave., N. Chicago
(Gibberellic Acid)

Eli Lilly & Co.
740 S. Alabama St., Indianapolis 6
(Gibberellic Acid)

Fine Organics Inc.
205 Main St., Lodi, N. J.
(Naphthaleneacetic Acid)

Heyden-Newport Chemical Corp.
342 Madison Ave., New York
(maleic hydrazide)

Merck & Co., Chemical Division
Rahway, N. J.
(Indole Butyric Acid, Gibberellic Acid)

Miller Products Co.
S.W. Caruthers St., Portland 1, Ore.
(Naphthalene Acetic Acid)

Miller Chemical & Fertilizer Corp.
2226 N. Howard St., Baltimore
(Naphthalene Acetic Acid)

S. B. Penick & Co.
50 Church St., New York 8
(Gibberellic Acid)

Chas. Pfizer & Co.
630 Flushing Ave., Brooklyn 6
(Gibberellic Acid)

Texas Co.
332 S. Michigan Ave., Chicago 4
(Naphthalene Acetic Acid)

U. S. Rubber Co., Naugatuck Div.
Naugatuck, Conn.
(Maleic Hydrazide, Phthalamic Acid)

Velsicol Chemical Corp.
330 E. Grand Ave., Chicago 11
(Gibberellic Acid)

POTASH

American Potash & Chemical Corp.
3030 W. 6th St., Los Angeles, 54

Berkshire Chemicals Inc.
420 Lexington Ave., N. Y., 17
(Nitrate of Potash)
See advertisement on page 114

H. J. Baker and Bro.
500 5th Ave., New York, 20

Bonneville, Ltd.
Salt Lake City, Utah

Bradley & Baker
155 E. 44th St., New York
See advertisement on page 105

duVal Sulphur & Potash Co.
exclusive distributor:
Ashcraft Wilkinson Co.
Trust Co. of Georgia Bldg., Atlanta

International Ore & Fertilizer Corp.
500 5th Ave., New York, 36

International Minerals & Chemical Corp.
Skokie, Ill.

International Commodities Corp.
11 Mercer St., New York 13

Potash Import & Chemical Corp.
285 Madison Ave., New York 17

Southwest Potash Corp.
61 Broadway, New York 6

Potash Company of America
1625 Eye St., N.W., Washington, D. C.

U. S. Potash Div., U. S. Borax & Chemical Corp.
50 Rockefeller Plaza, New York, 20

PRIVATE BRANDS — See Custom Packaging

PROTECTIVE CLOTHING—See Clothing

PULVERIZERS — See Mills

PUMPS

Aldrich Pump Co.
Pine St., Allentown, Pa.

Aurora Pump Div.
Aurora, Ill.

Buffalo Pumps
524 Broadway, Buffalo

Dean Hill Pump Co.
4020 E. 16th St., Indianapolis, Ind.

Dorr-Oliver Inc.
Stamford, Conn.

Duriron Co.
425 N. Findley, Dayton, O.

Goulds Pumps, Inc.
Seneca Falls, N. Y.

Hypro Engineering Co.
700 39th St., N.E., Minneapolis, Minn.

PUMPS (Cont.)

Johnston Pump Co.
Pasadena, Calif.

Proportioneers, Inc.
Harris Ave., Providence, R. I.

Roper Co.
Kankakee, Ill.

Tryco Manufacturing Co.
Decatur, Ill.

Warren Pumps, Inc.
Warren, Mass.

Viking Pump Co.
Cedar Falls, Ia.

Worthington Corp.
Harrison, N. J.

PYRETHRUM — See Insecticides

REFRACTORIES

Plibrico Co.
1818 Kingsbury, Chicago

REPELLENTS

Cowles Chemical Co.
7016 Euclid Ave., Cleveland 3
(Diethyl Toluamide)

Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17
(Crag)

Glenn Chemical Co.
2735 N. Ashland Ave., Chicago 14
(Tabatrex)

R. F. Greeff & Co.
10 Rockefeller Plaza, New York 20
(Diethyl Toluamide)
See advertisement on page 138

Hercules Powder Co.
900 Market St., Wilmington 99
(Diethyl Toluamide)

McLaughlin Gormley King Co.
1715 S.E. 5th St., Minneapolis
(MGK Repellent)

RESPIRATORS — See Masks

RODENTICIDES

Amchem Products Inc.
Ambler, Pa.
(Fumarin)

Inland Chemical Corp.
415 Lexington Ave., New York

Motomco, Inc.
Terminal Ave., Clark, N. J.
(Pival, Pivalyn)

S. B. Penick & Co.
50 Church St., New Work 8
(Warfarin)

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1
(Warfarin)

ROTENONE — See Insecticides

RYANIA — See Insecticides

SABADILLA — See Insecticides

SCALES — See also Bag Packing Weighing Machinery

Allen Scale Co.
774 Murphy Ave., S. W., Atlanta 3

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Burrows Equipment Co.
1316-AC Sherman Ave., Evanston, Ill.
(Portable)

Dorr-Oliver, Inc.
Stamford, Conn.

Exact Weight Scale Co.
941 West 5th Ave., Columbus 8

Omega Machine Co.
345 Harris Ave., Providence, R. I.

Richardson Scale Co.
668 Van Houten Ave., Clifton, N. J.

Thayer Scale & Engr. Corp.
Pembroke, Mass.

Toledo Scale Co.
Toledo, Ohio

Weighing and Control Components, Inc.
206-P Lincoln Ave., Hatboro, Pa.
See advertisement on page 126

Winslow Governor Standard Scale Works, Inc.
Winslow & 25th St., Terre Haute, Ind.

SCREENING-SIFTING-CLASSIFYING EQUIPMENT

Atlanta Utility Works
East Point, Ga.

Bonded Scale & Machine Co.
2176 S. 3rd St., Columbus 7, Ohio

Cleveland Vibrators Co.
2828 Clinton St., Cleveland

Davidson Kennedy Co.
Box 97, Station D, Atlanta

B. F. Gump Co.
1338 S. Cicero Ave., Chicago

Hewitt Robins Inc.
Stamford, Conn.

Inglett & Co.
P. O. Box 3425, Augusta, Ga.

Kennedy-Van Saun Mfg. & Eng'g Corp.
405 Park Ave., N. Y. 22

Ludlow Saylor Wire Cloth Co.
634 S. Newstead Ave., St. Louis, Mo.

Simplicity Engineering Co.
Durand, Mich.

Southwestern Engineering Co.
4800 Santa Fe Ave., Los Angeles 58

Stephens-Adamson Manfacturing Co.
Aurora, Ill.

Stedman Foundry & Machine Co.
Aurora, Ill.

Sturtevant Mill Co.
123 Clayton St., Boston, 22
See advertisement on page 131

W. S. Tyler Co.
3615 Superior St., Cleveland 14

Universal Vibrating Screen Co.
Racine, Wis.

Young Machinery Co.
Muncy, Pa.

SEED TREATMENTS — See Fungicides

SEPARATORS, Magnetic

Dings Magnetic Separator Co.
4711 W. Electric Av., Milwaukee 46

Eriez Mfg. Co.
Erie 6, Pa.

Magni-Power Co.
Wooster, Ohio

SODIUM MOLYBDATE — See Trace Elements

SOIL FUMIGANTS—See Nematocides

SOLVENTS (for insecticides)

Amoco Chemicals Corp.
910 S. Michigan Ave., Chicago 80
(Panasol)

Cosden Petroleum Corp.
Big Springs, Tex.
(Xylene)

Crowley Tar Products Co.
271 Madison Ave., New York 16
(Xylol)

Eastern States Petroleum & Chem. Corp.
P. O. Box 5008, Austin 12, Tex.
(Espesol)

Esso Standard Oil Co.
15 West 51st St., New York 19

Neville Chemical Co.
Neville Island, Pittsburgh 25

Penn Industrial Chem. Corp.
Clairton, Pa.

Penola Oil Co.
15 West 51st St., New York 19
(Penola HAN)

Richfield Oil Corp.
555 S. Flower St., Los Angeles 17
(Toxisol PX)

Sinclair Chemicals
600 Fifth Ave., New York

Skelly Oil Co.
605 W. 47th St., Kansas City 41
(Skellysolve)

L. Sonneborn Sons
300 Fourth Ave., New York 10

SPRAY NOZZLES — See Valves, Nozzles

SPREADERS-STICKERS

Antara Chemicals Div., General Aniline & Film Corp.
435 Hudson St., New York 14

Armour & Co., Adhesives Div.
1355 W. 31st St., Chicago 9

Chipman Chemical Co.
Bound Brook, N. J.

Colloidal Products Corp.
11 Gate 5 Rd., Sausalito, Calif.

Florida Agricultural Supply Co.
P. O. Box 658, Jacksonville, Fla.

General Chemical Div.,
Allied Chemical Corp.
40 Rector St., New York 6
(Plyac)

Holloway-Sucro Chemicals Corp.
57-02 48th St., Maspeth 78, N. Y.

Miller Products Co.
S. W. Caruthers St., Portland 1, Ore.

National Aniline Div., Allied Chemical Corp.
40 Rector St., New York 6
(Nacconol)
See advertisement on page 12

Pennsalt Mfg. Co. of Washington
2901 Taylor Way, Tacoma, Wash.
(Penco Activator)
See advertisement on page 52

Rohm & Haas Co.
Washington Sq., Philadelphia 5
(Triton)

A. E. Staley Mfg. Co.
Decatur, Ill.
(Soybean Flour and Corn Starch)
See advertisement on page 135

STORAGE (including Silos)

Marietta Concrete Corp.
Marietta, O.

Edward S. Nelson Co.
Clarksdale, Miss.

National Tile Silo Co.
Livestock Exchange Bldg.
Kansas City, Mo.

SULPHUR

duVal Sulphur & Potash Co.
exclusive distributor:
Ashcraft Wilkinson Co.
Atlanta, Ga.
See advertisement on page 10

Flag Sulphur & Chemical Co.
P. O. Box 5437, Tampa 5, Fla.

Freeport Sulphur Co.
161 E. 42nd St., N. Y., 17

Gulf Sulphur Co.
Houston, Texas

International Ore & Fertilizer Corp.
500 Fifth Ave., New York 36
See advertisement on page 110

Jefferson Lake Sulphur Co.
Whitney Bldg., New Orleans

Olin Mathieson Chemical Corp.
Baltimore 3, Md.

Pan American Sulphur Co.
609 Bank of the S.W. Bldg., Houston

Stauffer Chemical Co.
380 Madison Ave., N. Y. 17

Texas Gulf Sulphur Co.
75 East 45th St., N. Y. 17

Texas International Sulphur Co.
Houston, Tex.

SULFURIC ACID

American Agricultural Chemical Co.
100 Church St., New York 7

American Cyanamid Co.
30 Rockefeller Plaza, N. Y. 20
See advertisement on page 34

Dixon Chemicals
Paulsboro, N. J.

W. R. Grace Co., Davison Chemical Div.
Baltimore 3, Md.

Monsanto Chemical Co.
St. Louis 24, Mo.

Northern Chemical Industries
Totman Bldg., Baltimore 2, Md.

Olin Mathieson Chemical Corp.
Little Rock, Ark.

Planters Fertilizer & Phosphate Co.
Charleston Heights, S. C.

Stauffer Chemical Co.
380 Madison Ave., N. Y. 17

Tennessee Corp.
617-29 Grant Bldg., Atlanta

U. S. Industrial Chemicals Co.
99 Park Ave., N. Y. 16

SURFACTANTS—See Wetting Agents

SYNERGISTS

Fairfield Chemicals Div., FMC
441 Lexington Ave., New York 17
See advertisement on 4th cover

McLaughlin Gormley King Co.
1715 S. E. 5th St., Minneapolis

S. B. Penick & Co.
100 Church St., New York 8

Prentiss Drug & Chemical Co.
101 West 31st St., New York 1
See advertisement on page 27

TANKS

Abrasion & Corrosion Eng'g Co.
Amarillo, Tex.

J. B. Beaird Co., Inc.
Clinton, Iowa

Birmingham Tank Co.
Birmingham, Ala.

Butler Mfg. Co.
7312 E. 13th St., Kansas City, Mo.

R. D. Cole Manufacturing Co.
Newman, Ga.

Dallas Tank Co., Inc.
203 W. Commerce, Dallas 22, Texas

Flint Steel Corp.
Box 3155, Memphis, Tenn.

Lubbock Machine & Supply Co.
P. O. Box 1589, Lubbock, Texas

Edward S. Nelson, Ltd.
Clarksdale, Miss.

TESTING — See Consultants

TRACE ELEMENTS (copper sulfate, zinc sulfate, manganous oxide, etc.)

American Metal Climax, Inc.
500 Fifth Avenue, N. Y., 36
(molybdenum)

American Limestone Co.
Knoxville, Tenn.
(zinc, magnesium, copper)

W. R. E. Andrews Co.
1505 Race St., Phila. 2
(copper, zinc, manganese)

Berkshire Chemicals Inc.
630 Third Ave., New York 17
(magnesium)
See advertisement on page 114

Crown Zellerbach Corp.
231 Sansome St., San Francisco
(iron)

Davies Nitrate Co.
118 Liberty St., N. Y. 6
(manganese, iron, copper, boron, zinc)
See advertisement on page 129

Eastman Chemical Products, Inc.
Kingsport, Pa.
(manganese)

Glyco Products Co.
26 Court St., Brooklyn 2, N. Y.
(iron)

International Commodities Corp.
11 Mercer St., New York 13, N. Y.
See advertisement on page 112

International Ore & Fertilizer Corp.
500 Fifth Ave, New York 36
See advertisement on page 110

Nutrilite Products, Inc.
Buena Park, Calif.
(iron, zinc, manganese)

Phelps Dodge Refining Corp.
300 Park Ave., New York 22
(copper)
See advertisement on page 6

Tennessee Corp.
617-629 Grand Bldg., Atlanta, Ga.
(iron, copper, zinc, manganese)

United States Borax & Chemical Corp.
50 Rockefeller Plaza, N. Y. 20
(boron)

TRACTOR SHOVELS

Clark Equipment Co.
2463 Pipestone Rd., Benton Harbor, Mich.

J. I. Case Co.
Racine, Wis.

Frank G. Hough Co.
Libertyville, Ill.

Lessman Mfg. Co.
2005 Easton Blvd., Des Moines, Ia.

Tractomotive Corp.
Deerfield, Ill.

Yale & Towne Mfg. Co.
Philadelphia, Pa.

VALVES — NOZZLES

Bastian Blessing Co.
4201 W. Peterson Ave., Chicago 46

Bete Fog Nozzle Co.
Greenfield, Mass.

Grinnell Co.
260 W. Exchange Pl., Providence, R. I.

Henry Valve Co.
3215 North Ave., Melrose Park, Ill.

Minneapolis Honeywell Regulator Co.
5800 N. 7th St., Philadelphia 44

Monarch Manufacturing Works, Inc.
3406 Miller St., Philadelphia 34

Spraying Systems Co.
3230 Randolph St., Bellwood, Ill.

Squibb Taylor Inc.
1213 S. Akard St., Dallas, Texas

VIBRATORS — See Conveyors, Feeders

WEED KILLERS — See Herbicides

WETTING AGENTS

American Cyanamid Co.
30 Rockefeller Plaza, New York 20

Antara Chemicals Div., General Aniline & Film Corp.
435 Hudson St., New York 14
See advertisement on page 31

Monsanto Chemical Co.
St. Louis 24

National Aniline Div., Allied Chemical Corp.
40 Rector St., New York 6

Ultra Chemical Works
2 Wood St., Paterson 4, N. J.

APPLICATORS' SECTION

AGRICULTURAL AIRCRAFT

American Airmotive Corp.
P. O. Box 187, Miami 48, Fla.
(NA-75 "composite" Stearman)

Auster Aircraft Ltd.
Rearsby, Leicester, England
(Workmaster, Agricola)

Bell Helicopter Corp. (helicopters)
P. O. Box 482, Fort Worth, Texas

CallAir, Inc. (A-5 & A-6)
Afton, Wyo.

Champion Aircraft (Aeronca, Sky-Trac)
Osceola, Wisc.

Clark Aircraft, Inc. (Ag-Biplane)
P. O. Box 903, Marshall, Texas

De Havilland Aircraft Co. Ltd.
Hatfield Aerodrome, Hatfield, Hertfordshire, England
(Chipmunk MK23)

Fletcher Aviation Corp. (FU-24)
Rosemead, Calif.

Grumman Aircraft Engineering Corp.
Bethpage, L. I., N. Y.
(Ag-Cat)

Hiller Helicopters (helicopters)
1350 Willow Road, Palo Alto, Calif.

Jackaroo Aircraft Ltd. (Jackaroo)
Thruxton Aerodrome, Andover, Hants, England

Kellett Aircraft Corp.
Box 35, Willow Grove, Pa.
(Cropmaster autogiro)

Michele Aircraft Corp. (Mike helicopter)
29 H. St., N. W., Washington 1, D. C.

Netherlandse Helicopter Industrie N. V.
Rotterdam Airport, Rotterdam, Holland
(Kolibrie H3 ramjet helicopter)

Piper Aircraft Corp. (Pawnee)
Lock Haven, Pa.

Rawdon Bros. Aircraft, Inc.
10412 E. Central Ave., Wichita, Kans.
(Rawdon T-1)

Republic Aviation Corp., Helicopter Div.
Farmingdale, L. I., N. Y.
(Alouette II helicopter)

Sikorsky Aviation Division, United Aircraft Corp. (helicopters)
Stratford, Conn.

Simpson & Whitney Aviation (Airplane)
Box 141, Liberal, Kans.

Snow Aeronautical Co. (Model S-2A)
Olney, Texas

Transland Co. (AG-2)
2600 West 247th St., Torrance, Calif.

AERIAL SPRAY EQUIPMENT

Accessories Mfg. Co. (spray nozzles)
922 Independence St., Kansas City, Mo.

Bete Fog Nozzle Co. (spray nozzles)
309 Welles St., Greenfield, Mass.

Columbia Exporters (pumps)
730 S.E. 11th St., Portland, Ore.

Dakota Aviation Co.
Huron, S. D.
(Aero-Dyne spray tanks)

Harang Engineering
840 Lake St., San Bruno, Calif.
(cleaner for spray equipment)

Hawthorne Aircraft Industries
Valley View Ranch, Lucerne Valley, Calif.
(Stearman parts)

Nissen Aviation Products
1840 Emory St., San Jose, Calif.
(Span-flow spreader)

Fred W. Pickell & Associates
5707 York Blvd., Los Angeles 42, Calif.

Prairie Air, Inc.
P. O. Box 786, Clarksdale, Miss.
(Bartlebaugh combination spreaders)

Harold L. Root (pumps)
406 E. Walnut St., Visalia, Calif.

Root-Lowell Corp. (spray nozzles)
445 N. Lake Shore Dr., Chicago

Servo Engineering (hoppers)
Dos Palos, Calif.

Simplex Manufacturing Co.
5224 NE 42nd Ave., Portland 18, Ore.
(pumps, dump valves, spray booms)

Sorensen Aircraft (spray units)
Worthington, Minn.

Spray Engineering Co. (spray nozzles)
100 Cambridge St., Burlington, Mass.

Spraying Systems Co. (spray nozzles)
3230 Randolph St., Bellwood, Ill.
See advertisement on page 138

Transland Co.
2600 West 247th St., Torrance, Calif.
(Swathmaster combination spreader)

CHEMICALS for Aerial Application—
See Insecticides, p. 79; Fungicides, p. 77; Herbicides, p. 78

MISCELLANEOUS AIRCRAFT EQUIPMENT & SUPPLIES

Aeroquip Corp. (hose assemblies)
Jackson, Mich.

Agricultural Aviation Engineering Co.
858 Scott St., Santa Clara, Calif.
(components, systems, designs)

H. D. Campbell Co.
Farm Products Div., Rochelle, Ill.
(fertilizer concentrate solutions)

Clark Aircraft, Inc.
P. O. Box 903, Marshall, Texas
(metal wings & parts, Stearman)

Cooper Industries, Inc.
2149 W. Pratt Blvd., Elk Grove, Ill.
(Super Flite aircraft finishes)

Copon Associates (airplane paint)
P. O. Box 1113, Houston 1, Texas

Dresser-Ideco Co. (hangars)
875 Michigan Ave., Columbus 8, Ohio

MISCELLANEOUS AIRCRAFT EQUIPMENT (Cont'd.)

Elmer's Wing Shop
P. O. Box 85, Waukena, Calif.
(wooden Stearman wings)

Eonair, Inc. (Eonite fabric covers)
Shafter Airport, Bakersfield, Calif.

H & M Agriflight High Lift Wing
Mesa Del Ray Airport, King City, Calif.
(metal-ribbed Stearman wings)

Motorola Communications & Electronics Inc. (two-way radios)
4501 W. Augusta Blvd., Chicago 51

Randolph Products Co.
12th St., Carlstadt, N. J.
(Butyrate finishes)

Ruleto Industries Inc.
4823 Rosecrans Ave., Hawthorne, Calif.
(metal Stearman wings)

Ruth Street Aircraft Woodwork
Salina Municipal Airport, Salinas, Calif.
(wooden Stearman wings)

Sky Store (goggles & helmets)
Hawthorne, Calif.

Vern's Wing Shop
Hiway 80, El Centro, Calif.
(wooden Stearman wings)

FERTILIZER APPLICATING EQUIPMENT

Adams & Doyle Equip. Mfg. Co.
Quincy. Ill.
(spreaders)

American Steel Dredge Co., Inc.
Fort Wayne, Ind.
(self-propelled liquid applicator)

Baughman Manufacturing Co.
236 Shipman Road, Jerseyville, Ill.
(blender-spreaders)

John Blue Co., Inc. (liquid applicators)
Huntsville, Ala.

Broyhill Co.
Dakota City, Nebr.

Campbell Mfg. Co.
Walthill, Nebra.

Century Engineering Corp.
401 Third St., S.E., Cedar Rapids, Iowa
(granule applicators)

Chowning Regulator Corp.
Corning, N. Y.
(pellet applicator)

Clark Manufacturing Co.
Atherton, Mo.
(liquid applicators)

John Deere (liquid & dry applicators)
Moline, Ill.

Dempster Mill Mfg. Co.
Beatrice, Nebr.
(liquid & dry applicators)

Fabricated Metals, Inc.
2400 Merced St., San Leandro, Calif.
(bulk application equipment and liquid applicators)

Farmhand Co. (manure spreaders)
Hopkins, Minn.

Gandy Co. (granule applicators)
Owatonna, Minn.

General Metals (liquid applicators)
P. O. Box 448, Greensboro, N. C.

Highway Equipment Co.
698D Ave. N.W., Cedar Rapids, Iowa
(blender-spreaders)

Hercules Steel Products Corp.
Galion, Ohio
(spreaders)

International Harvester Co.
180 N. Michigan Ave., Chicago 1
(liquid applicators)

KBH Corp. (NH_3 applicators)
Box 246, Clarksdale, Miss.

Pollard Mfg. Co. (liquid equipment)
Foshay Tower, Minneapolis, Minn.

Schelm Brothers, Inc.
201 Anna St., East Peoria, Ill.
(liquid applicators)

Simonsen Manufacturing Co.
Quimby, Iowa
(tractor-drawn spreaders)

Southern States Cooperative
Seventh and Main Sts., Richmond 13, Va.
(blender-spreaders)

Standard Steel Mfg. Co., Inc.
2137 N. Sherman Drive, Indianapolis, Ind.
(spreaders)

Tryco Mfg. Co. (liquid applicators)
P. O. Box 1272, Decatur, Ill.

Welcome Mfg. Co. (NH_3 applicators)
Welcome, Minn.

INSECTICIDE APPLICATING EQUIPMENT

Acmeline Mfg. Co. (hand sprayers)
Traverse City, Mich.

American Steel Dredge Co., Inc.
Fort Wayne, Ind.
(self-propelled sprayers)

Arrow Products Co. (fumigators)
447 Lincoln St., Carlstadt, N. J.

B & G Company (sprayers)
Plumsteadville, Pa.

Banta Hi-Fog Co. (sprayers)
812 Truckway, Montebello, Calif.

John Bean Div., Food Machinery & Chemical Corp.
1305 S. Cedar St., Lansing 4, Mich.
(mist blowers, sprayers, granule applicators)

R. & E. Bertani (mist sprayers)
Abbiategrasso (Milan) Italy

Besler Corp. (aerosol insecticide sprayers)
4053 Harlan St., Emeryville, Calif.

Broyhill Co. (sprayers)
Dakota City, Nebr.

Buffalo Turbine Agricultural Equipment Co.
70 Industrial St., Gowanda, N. Y.
(mist blowers, sprayers, dusters)

Campbell Bros. (mist blowers, sprayers)
30 Deerefield St., Greenfield, Mass.

Campbell Mfg. Co. (sprayers)
Walthill, Nebr.

Carter Insecticide & Chemical Co.
Box 209, Wallace, N. C.
(fumigation kits)

Century Engineering Corp.
401 Third St., SE, Cedar Rapids, Iowa
(granule applicators, sprayers)

Champion Sprayer Co. (sprayers)
6509 Heintz Ave., Detroit 11

R. E. Chapin Mfg. Co. (hand sprayers)
Batavia, N. Y.

Collins Feed & Supply Co.
Miami Shores 38, Fla.
(garden-type applicators)

Cooper, Pegler & Co. Ltd.
P. O. Box 9-307, Burgess Hill, Sussex, England
(mist blowers, dusters)

Cordox Corp. (mist blowers)
Bell Building, Chicago 1

Curtis Automotive Devices, Inc.
P. O. Box 323, Bedford, Ind.
(fogging devices)

Decker Mfg. Co. (sprayers)
Janesville, Wisc.

John Deere (heavy duty dusters)
Moline, Ill.

Devenco Inc. (fog applicator)
150 Broadway, New York 38

Dobbins Div., Chamberlain Corp.
Waterloo, Iowa
(hand sprayers)

Dorman Sprayer Co., Ltd.
Ditton Walk, Cambridge, England
(knapsack sprayer & duster)

Ekholm Mfg. Co. (sprayers)
St. Paul 2, Minn.

Fabricated Metals, Inc.
2400 Merced St., San Leandro, Calif.
(fumigation equipment)

A. B. Farquhar Div., The Oliver Corp.
400 W. Madison St., Chicago 6
(mist blowers)

See advertisement on page 60

See advertisement on page 132

INSECTICIDE APPLICATING EQUIPMENT (Cont'd.)

Finco, Inc. (high-clearance sprayers)
Aurora 37, Ill.

Friend Manufacturing Co.
7 Prospect St., Gasport, N. Y.
(mist blowers)

Fumeral Co. (steam sprayers)
Racine, Wisc.

Gallo Co. (sprayers)
1312 Forest St., Racine, Wisc.

Gandy Chemical Co.
Owatonna, Minn.
(pre-emerge spray kits)

Gard Industries, Inc. (sprayers)
1729 Harding Rd., Northfield, Ill.

Gustafson Mfg. Co. (soil fumigators)
Corpus Christi, Tex.

Hahn, Inc. (high-clearance sprayers)
1825 W. Franklin St., Evansville 12, Ind.

Hanson Equipment Co. (sprayers)
327 Charles St., Beloit, Wisc.

Hardie Manufacturing Co.
1825 W. Franklin St., Evansville, Ind.
(sprayers, mist blowers)

Homelite Corp. (mist blowers)
Port Chester, N. Y.

Howard Rotavator Co.
1600 E. Davis St., Chicago
(soil mixer)

Hub States Chemical & Equipment Co.
1255 N. Windsor St., Indianapolis, Ind.
(sprayers)

H. D. Hudson Manufacturing Co.
589 E. Illinois St., Chicago 11
(sprayers)

Insect Control Sales & Service
P. O. Box 152, Candor, N. C.
(soil fumigant applicators)

Jaeckh Mfg. Co. (hand sprayers)
Cincinnati

KBH Corp.
P.O. Box 246, Clarksdale, Miss.
(hi-clearance sprayers)

MacCarl Co. (hand sprayers)
4342 Pearl Rd., Cleveland

Mayrath Co. (sprayers)
Dodge City, Kans.

F. E. Myers & Bro. Co.
249 Orange St., Ashland, Ohio
(sprayers, mist blowers)

Niagara Chemical Div., Food Machinery & Chemical Corp.
100 Niagara St., Middleport, N. Y.
(liquid-dust applicators, mist blowers)

Nisto Gmbh. (electric aerosol sprayers)
Vienna, Austria

Noble Manufacturing Co.
Sac City, Iowa
(granular DDT applicators)

Oliver Corp. (sprayers)
400 W. Madison St., Chicago 6

Potts Feed Mill & Gin Co. (mist blowers)
Box 51, Crawford, Miss.

Robinson Fan Corp. (mist blowers)
Gilroy, Calif.

Root-Lowell Corp. (sprayers)
445 North Lake Shore Dr., Chicago 11

Schelm Bros. Inc. (sprayers)
201 Anna St., E. Peoria, Ill.

Silver Creek Precision Corp (sprayers)
Silver Creek, N. Y.

D. B. Smith & Co., (hand sprayers)
414 Main St., Utica, N. Y.

Southern Mill Creek Products Co.
P. O. Box 4297, Tampa, Fla.
(sprayers)

Standard Container, Inc.
Rockaway, N. J.
(hand sprayers)

Standard Steel Mfg. Co. (sprayers)
2137 N. Sherman Dr., Indianapolis 18, Ind.

Todd Shipyards Corp (sprayers)
81-16 45th Ave., Elmhurst, N. Y.

Tryco Mfg. Co. (sprayers)
P. O. Box 1272, Decatur, Ill.

Universal Metal Prods. Co.
Lowell, Mich.
(hand sprayers)

Victor Products Corp. (sprayers)
Ranson, W. Va.

Volume Spray Mfg. Co. (hand sprayers)
Tulsa, Okla.

Walsh Mfg. Co. (boom sprayers)
Charles City, Iowa

Z & W Mfg. Corp. (hand sprayers)
30240 Lakeland Blvd., Wickliffe, Ohio

MASKS and RESPIRATORS (See page 82)

MISCELLANEOUS GROUND EQUIPMENT

Acme Protection Equipment Co.
1201 Kalamazoo St., South Haven 6, Mich.
(face masks)

Allis-Chalmers (tractors)
Milwaukee 1, Wisc.

American Optical Co. (respirators)
Mechanics St., Southbridge, Mass.

Bete Fog Nozzle Co. (nozzles)
309 Welles St., Greenfield, Mass.

John Blue Co. (fertilizer pumps)
Huntsville, Ala.

Boettcher Supply Co.
Beloit, Kansas
(NH_3 applicator knife)

Broyhill Co. (lined tanks)
Dakota City, Nebr.

J. I. Case Co. (tractors)
700 State St., Racine, Wisc.

Caterpillar Tractor Co. (tractors)
Peoria, Ill.

Cooley Spray Equipment Works
Somers, Conn.
(spray discs, jet nozzles)

John Deere (tractors)
501 3rd Ave., Moline, Ill.

Delvan Manufacturing Co.
West Des Moines, Iowa
(nylon nozzles)

Deming Co. (liquid fertilizer pumps)
510 Broadway, Salem, Ohio

Dorr-Oliver, Inc. (rubber-lined pumps)
Stamford, Conn.

Fairbanks-Morse & Co. (pumps)
600 S. Michigan Ave., Chicago 5

Flexo Products, Inc. (dust masks)
Westlake, Ohio
See advertisement on page 60

Four Corner's Mfg.
5055 Crater Lake Hwy., Medford, Ore.
(NH_3 applicator knife)

General Metals Inc.
858 Goldsboro St., Greensboro, N. C.
(pressure & non-pressure tanks)

Gorman-Rupp Co. (pumps)
305 Bowman St., Mansfield, Ohio

Harang Engineering Co.
840 Lake St., San Bruno, Calif.
(cleaner for spray rigs)

Hardie Manufacturing Co. (pumps)
1825 W. Franklin St., Evansville, Ind.

H. D. Hudson Mfg. Co. (spray booms)
589 East Illinois St., Chicago 11

Hypro Engineering Inc. (fertilizer pumps)
709 30th Ave., N. E., Minneapolis 21, Minn.

International Harvester Co. (tractors)
180 N. Michigan Ave., Chicago 1

Martindale Electric Co. (respirators)
1375 Hird Ave., Lakewood, Cleveland, Ohio

Massey-Ferguson Inc. (tractors)
Racine, Wisc.

Mine Safety Appliances Co.
201 N. Braddock Ave., Pittsburgh 8, Pa.
(respirators, gas masks, protective clothing)

Oliver Corp. (tractors)
400 W. Madison St., Chicago 6

Root-Lowell Corp. (spray nozzles)
445 N. Lake Shore Dr., Chicago

Schutte & Koerting Co. (nozzles)
Cornwells Heights, Bucks County, Pa.

Spray Engineering Co. (spray nozzles)
100 Cambridge St., Burlington, Mass.

Spraying Systems Co. (nozzles)
3230 Randolph St., Bellwood, Ill.
See advertisement on page 138

Stam's Mfg. Plant
114 N. 5th St., Watseka, Ill.
(NH_3 applicator knife)

Superior Steel & Malleable Castings Co.
700 Graham St., Benton Harbor, Mich.
(NH_3 applicator knife)

Tiura Mfg. & Sales
P. O. Box 1087, Patterson, Calif.
(applicator clamps & Shanks)

Taylor Machine Works
Louisville, Miss.
(NH_3 applicator knife)

Willson Products Div., Ray-O-Vac Co.
Second and Washington Sts., Reading, Pa.
(respirators)

Wisconsin Motor Corp.
Milwaukee 46, Wisc.
(engines for sprayers)

Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 9

Record Crops This Year Indicate Good Fertilizer Market for 1960

Record cotton and corn crops plus continued high farm productivity in general are promising indications of another good fertilizer year in 1960.

Latest official crop forecasts from Washington predict the highest cotton crop in history, more than 14,800,000 bales. That's a resounding 29% increase over last year's crop. More significant, with yield prospects good to excellent in all states, the indicated per acre cotton yield is 474 pounds. That tops the past 10-year average by 145 pounds. Production records like this set plant food removal records too.

Based on known plant food requirements, this year's anticipated cotton production represents a calculated soil fertility drain of 296,300 tons of Nitrogen, 148,150 tons of P_2O_5 and 98,742 tons of K_2O. *(This is the plant food removed by lint and seed, not including that required by stalks, leaves and burrs.)*

To maintain their high rate of production, farmers will need large supplies of mixed fertilizer next year.

Cotton this year is being grown under a new Federal program designed to open up broader markets by lowering price supports to growers. The program permitted growers to expand acreage, and they did, increasing cotton land from 11,849,000 acres harvested last year to nearly 15,000,000 acres this year. Most of this acreage had been in the Soil Bank during 1958.

Observers in Washington believe there will be no major farm legislation to change the government's cotton program between now and the next crop season. With expanded acreage and farmers aiming at increased yields too, the cotton belt fertilizer market looks promising.

ESTIMATED PLANT FOOD REMOVAL BY MAJOR CROPS IN 1959
(Based on latest forecast production figures, August 1, 1959)

	Tons of N	Tons of P_2O_5	Tons of K_2O
CORN (4,173,470,000 bu.)	1,878,061	730,190	521,502
COTTON (14,815,000 bales)	296,300	148,150	98,742
WHEAT (1,118,960,000 bu.)	699,350	349,670	209,800

Plant food removal is calculated: on CORN for grain alone not including stover; on COTTON for lint and seed, not including stalks, leaves and burrs; on WHEAT for grain, not including straw.

Recent forecasts from the corn country indicate a tall crop of 4,173,470,000 bushels this year that stands 10% above last year's record production. Although yield per acre is slightly lower, removal of acreage allotments in commercial areas resulted in a 14% increase in corn acreage this season.

Huge Need for Fertilizer

This tremendous corn crop will take a fantastic amount of plant nutrients from the soil. Figuring from known plant food requirements for grain alone (excluding stover), removal of this much grain adds up to a calculated soil fertility drain of 1,878,061 tons of Nitrogen, 730,190 tons of P_2O_5 and 521,502 tons of K_2O.

Replacing that plant food for continued high production of corn offers a challenging fertilizer sales goal.

Although wheat and other grains showed lower prospects for yields and production this year, these crops still present a continued need for quality mixed fertilizers.

Looking at estimated total crop production, officials report the prospects are edging within 3% of last year's outstanding record. Among the leaders besides cotton and corn, sugar beets, dry peas, soybeans, dry beans and rice are running higher or equal to previous record production.

U.S.D.A. agricultural scientists at Beltsville, Maryland, recently reviewed the subject of plant food removal from

(Continued on following page)

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the soil. Looking at 1958 harvests, the scientists gave this priority to plant nutrient replacement in the soil: nitrogen, first; potash, second; and phosphorus, third.

As modern farmers strive for continually higher yields per acre, fertilizer is their best bargain. Surveys of rising farm production costs have indicated that fertilizer remains one of the best investments farmers can make. Fertilizer puts growing power into each acre and farmers know it.

Farm income in general is good this year, although it has dropped somewhat from last year's high level. However, buying power for the tools of high production is strong. After this season's heavy plant food removal, fertilizer will be needed to maintain production and farm income.

Farm advisors, county agents and other agricultural specialists have been advocating increased use of fertilizer to boost yields and cut costs of production. That fact of economics, combined with the plant food reduction in this big crop season, can lead to bigger sales for fertilizer in 1960.

SELL MORE FERTILIZER THIS FALL!

1958-59 was a big tonnage year for fertilizers. The best way to make 59-60 surpass it in sales is to sell more fertilizer this fall, ahead of the spring rush. Many farmers are good prospects for fall buying—if we get out and sell them. And, more than anything else, the fertilizer industry needs to expand its delivery seasons to take the pressure off spring production and shipping. Also, remember that fall discounts on ammoniating solutions and potash offer you better profit possibilities on mixed goods made and sold this fall than on those produced next spring. *Now is the time for action!*

More Farmers Use Fall Fertilizers

Leading farmers in many areas have been using more and more fertilizer in the fall. And they are seeing the advantages of fall application in: use of slack season labor, longer pasture seasons, better crop yields and reduced winter-kill of grain and hay stands.

The soil is a more economical place to store fertilizer over the winter than a barn or a dealer's warehouse. Fall-applied fertilizers have given excellent results on sod crops throughout the U.S. Fall plowdown of fertilizers has proved practical except on light sandy soils or in areas where winters are mild and humid.

Our long-accepted fall markets for fertilizer are expanding along with newly-accepted practices. Many stands of alfalfa and other legumes were winter-killed in the North last year. Farmers are anxious to do better this winter. Fall application of mixed fertilizer helps maintain thick, long-lived legume stands. Meadows, where legumes have run out, need high-nitrogen mixed fertilizers.

Fruit crops, too, can be fertilized in the late fall. Fall vegetables are another good market, and many growers like to apply fertilizer to cover crops in the autumn.

The burning of small-grain straw and stubble has almost disappeared, as farmers have found that plow-down of fertilizer with this organic matter improves the soil and helps build bigger yields of succeeding crops. When you work to build this plow-down market, you can also emphasize the value of fertilizer in the grain drill at planting time. This helps even late-planted fields to come up to a good stand that will live through the winter to produce a good crop.

Many farmers, as well as experiment stations, in the North have proved that grass haylands and pastures need fertilizer before fall freeze-up to strengthen the roots for earlier, heavier spring growth. Oats, wheat, clover and other grazing crops in the South need heavy fall fertilization to produce extra forage as well as a profitable grain crop. Thousands of acres of Coastal and Midland Bermuda grass that produce large tonages of feed in the warm months use huge amounts of plant food. Winter grazing crops, inter-seeded in such sod, are especially in need of heavy fertilizer application.

Fall Plow-Down

Cotton planters like to chop their stalks after harvest in early fall, to reduce insect carryover, and in heavy soil areas they may also plow out the old beds. Fall application of mixed fertilizer is an efficient way to get ready for the next crop, to help improve insect control, and to build extra growth of winter cover crops.

Corn land is one of the biggest fall fertilizer markets. Plow-down of fertilizer

with corn stalks and stubble is a soil and yield builder. This practice also works well for other heavy-feeding crops, such as sorghum and sugar beets.

Soil compaction by heavy equipment is one problem farmers avoid by fall spreading of fertilizer before plowing. Fall, with its dry ground, is the ideal time to spread fertilizer by truck or heavy tractor, without excessive soil compaction on sod or on land to be plowed.

Be sure your salesmen and dealers are acquainted with the fall fertilizer opportunities in their respective areas. Information on crop yields and photographs showing results of fall-applied fertilizers in previous years can be very helpful to your salesmen in developing more fall business this year. If varying soil textures are a problem, you will want to equip your men with soil maps indicating specific areas which are suitable for fall fertilizer application.

Fall Use Means Liberal Use

Fall fertilization favors liberal fertilizer application. Modern farming calls for a lot more plant food than a few hundred pounds per acre in the drill or planter. Top-dressing or plow-down in the fall makes heavy fertilizer use easy. It pays producers to do all they can to favor these two important trends.

Take a look at the map of your sales area. Before you finish counting all the acres of corn, small grains, meadows, pastures, vegetables and fruit that could benefit from fall fertilization, you'll probably stop figuring and get right out and start selling!

2-1-1 vs 1-1-1 for Grass

Only a few years ago, typical pasture fertilizers contained little or no nitrogen, and these fertilizers were often supplemented with nitrogen top-dressing. Then 1-1-1 ratios, such as 12-12-12 and 10-10-10, became popular and produced outstanding results. Today, there is a trend to higher nitrogen mixed fertilizers for pastures. Farmers and fertilizer men are finding that they make more money from 2-1-1 ratios, such as 16-8-8 fertilizer for grass.

A 2-1-1 ratio of nitrogen, phosphoric acid and potash does a far better job of meeting the exact plant food needs of grass than a 1-1-1 ratio. On fields that have been neglected, it may be advisable to use a 1-1-1 ratio for a year or two to build up soil supplies of plant foods. But this should be followed with regular use of a 2-1-1 ratio to supply fertilizer nutrients in the approximate ratio in which they are removed by grass for grazing and hay.

In Wisconsin, for example, where many pasture demonstrations have been fertilized with 16-8-8, the net profit per acre from increased forage yields has been exceptional. As a result, wherever fertilizer dealers sell 16-8-8, sales have been much larger than expected.

Complete pasture fertilizer, well-balanced with plenty of nitrogen (such as 16-8-8), produces better returns than a heavy application of 0-1-1 fertilizer followed later by nitrogen top-dressing. Experiments show that a heavy application of straight potash causes pasture plants to take up more of this element than is necessary for high yields. When nitrogen is applied with phosphorus and potash in a mixed fertilizer, the crop uses all of these nutrients more efficiently.

The fall is a good time to apply 16-8-8, and fall fertilization is one of the best ways to insure a much longer grazing season. In the cool weather of late fall and early spring, soil bacteria that provide available nitrogen from the soil become dormant at a much higher temperature than that at which grass becomes dormant. Grass needs plenty of nitrogen in the fall and early spring. For extra profits for you and the farmer, sell 16-8-8 fertilizer for pastures *now!*

AVERAGE RESULTS WITH 11 DEMONSTRATION PASTURE PLOTS, 1958

Fertilizer per acre	Yield per acre dry weight	Increase in yield	Value of increase	Cost of Fertilizer	Extra profit per acre
500 lbs. 16-8-8	8,388 lbs.	4,728 lbs.	$118.20	$21.50	$96.70
No fertilizer	3,660 lbs.				

(From Prof. C. J. Chapman, University of Wisconsin)

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	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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LISTENING POST

By Paul Miller

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Mycology and Plant Disease Reporting Section, Plant Protection Research Branch, United States Department of Agriculture, Beltsville, Maryland.

Apple Scab Control By Two N-Dodecylguanidine Fungicides

W. D. TUNIS and R. H. Sudds*, of the University of Connecticut, Storrs Agricultural Experiment Station, tested Cyprex (*n*-dodecylguanidine acetate) and Experimental Fungicide 23441 (*n*-dodecylguanidine acid phthalate), both products of the American Cyanamid Company, for effectiveness and safety in controlling apple scab (caused by the fungus *Venturia inaequalis*) and for compatibility with several different insecticides and miticides. Cyprex was tested in 1957 and 1958; E. F. 23441 in 1958 only. In both years captan 50W was used as the standard fungicide for comparison.

1957 Tests:

Three 20-year-old apple trees, one each of McIntosh, Cortland, and Red Delicious, made up the plots, each treatment being replicated four times. Trees were pruned to permit efficient spray coverage. Application was by a 25-gallon Bean hydraulic sprayer, operating at a pressure of 400-500 p.s.i. Each tree received 15 to 20 gallons at each spraying.

Dates of application were April 23, 30; May 6, 10, 14, 20, 25; June 4, 23, 30; May 6, 10, 14, 20, 25; June 4, 18; July 2, 16, 29; August 12, 23. Petal fall occurred on May 14. From petal fall on, malathion 25W and methoxychlor 50W, each at 2-100, were included in the sprays.

Rate of application of Cyprex 70W was 1½-100 up to June 18 and ¾-100 after June 18. Captan 50W was used at the rate of 2-100 up to June 18, and 1-100 afterward.

On June 5, a count was taken of scab spots visible at eye level on the leaves of each tree. The average number of leaf spots per tree was: for McIntosh, 89.4 on the check (untreated trees, 2.6 on trees sprayed with captan, 1.7 on trees sprayed with Cyprex; for Cortland, 61.2, 0.4, and 0.1, on checks, Captan-sprayed, and Cyprex-sprayed trees, respectively; for Delicious, 39.8 on the checks and none observed on trees sprayed with either fungicide. These figures show excellent control of scab in all the sprayed plots.

At the time of these counts, however, severe injury appearing as a black spot on the back sides of the fruit was evident on about 20 per cent of the fruit of all varieties in the Cyprex plots. The injured surfaces became russetted as the fruits grew. The authors stated that, according to representatives of the American Cyanamid Company, similar injury reported from several locations in the Northeast seemed to be associated with occurrence of low temperatures just before, during, or just after application of Cyprex at a high dosage rate. Examination of the weather records for the University orchard showed a drop in temperature to 39°F during the morning of May 21. Cyprex had been applied the day before. This coincidence of low temperature and application of Cyprex apparently supported the manufacturer's suggestion. The authors concluded that their observations did not furnish definite evidence of a direct causal rela-

(*Continued on Page* 130)

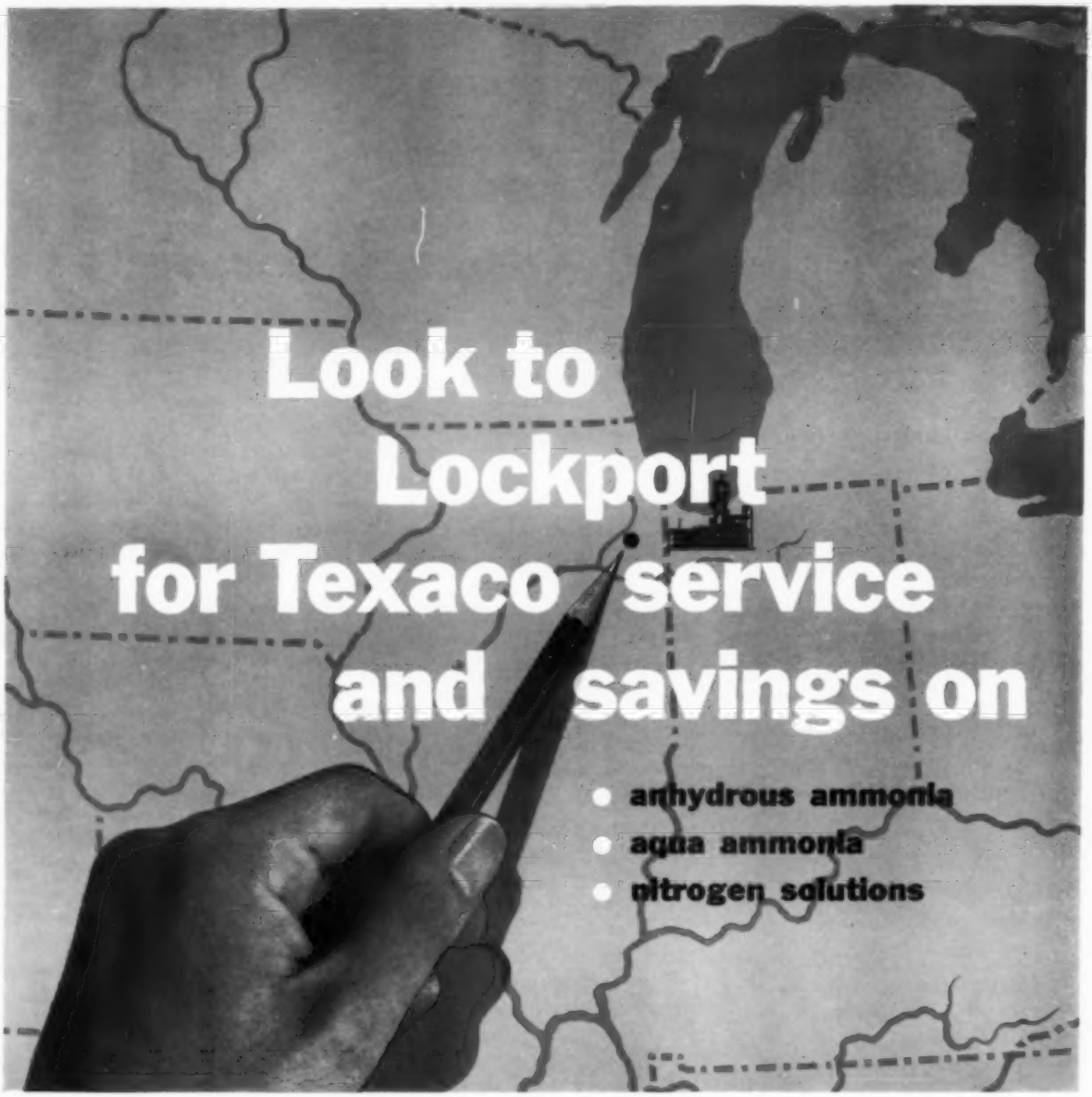
Table 1

Harvest counts of insect, disease, and other types of blemishes in Cyprex plots—September 20, 1957. (Table 2 of Tunis and Sudds)

Treatment	Variety	Percent clean	Percent scab	Percent light russet[a]	Percent heavy russet[b]	Percent insect damaged
Cyprex 70W	McIntosh	59.3	0.1	14.2	22.7	3.7
	Cortland	66.9	0.0	10.9	20.1	2.1
	Delicious	56.7	0.0	13.3	28.2	1.8
Captan 50W	McIntosh	90.1	0.6	6.2	1.2	1.9
	Cortland	92.5	0.0	3.7	0.7	3.1
	Delicious	86.6	0.1	9.4	1.9	2.0
Check	McIntosh	0.0	42.6	3.2	1.7	52.5

[a]Less than 10 percent of the fruit surface russeted.
[b]More than 10 percent of the fruit surface russeted.

*W. D. Tunis and R. H. Sudds, "Field *n*-dodecylguanidine fungicides for the control of apple scab," *Plant Disease Reporter*, Vol. 43, No. 4, pages 483-486, Apr. 15, 1959.



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WASHINGTON REPORT

By Donald Lerch

WHEN Soviet Premier Nikita Khrushchev visits the U.S., you can expect to hear some people *boasting* about our farm surplusses for a change. Our biggest domestic farm problem, in other words, is likely to be presented to Mr. K. as proof of the U. S. farmers' superior productivity.

Though he may not show it, the betting here is that full realization of the U. S. lead over the USSR in agriculture will hit Khruschev pretty hard. After all, Khruschev rose to power in the USSR with a reputation as a man who could get more farm production. Gains have been made since Stalin's death in 1953. Grain output is up some 70 percent. Production of sugar beets, potatoes, meat, eggs and milk are up.

But overall farmer productivity is still critically low. One farmer in the USSR can produce enough for himself and three others. With the aid of mechanization, fertilizers, chemicals, and improved practices one U. S. farmer can now produce enough for himself and 25 others. Some here feel that if Khrushchev is to be convinced he can't win in his attempt to outproduce the U. S., it will be the production record of free and independent American farmers that will do it.

This achievement of American farming is worth pondering, especially for those who sometimes feel that perhaps we are aiding the U.S. farmer to produce too much. The real goal of American agriculture today is to improve efficiency, give more consumers more food and fiber for their money, and reward efficient farmers with rising standards of living. Few items used in agriculture today do better jobs on all these scores than pesticides and fertilizers.

Significantly, both the National Plant Food Institute and the National Agricultural Chemicals Association recently have published reports on fertilizer and pesticide use in the USSR. Fertilizer production in the USSR is at the rate of 10 million tons a year, or about where the U.S. was in this field in the 1930's.

Use of pesticides in the USSR has been skyrocketing. It rose from 53,000 tons in 1940 to 390,000 tons currently. This is about one-fourth of what U. S. farmers now use, and corresponds roughly to where we stood on pesticide use in the mid-1940's.

With these figures a good case might be made that a major difference between U. S. and USSR farm productivity can be found in the figures on the greater fertilizer and pesticide use in the U. S. The role these products play in our superior farm efficiency is a fact of which everyone in the fertilizer and pesticide industries can well be proud.

* * * * * *

The National Plant Food Institute, incidentally, is now producing a new motion picture to present the role fertilizers play in farm abundance of food and fiber. To be called "Bread From Stone," the film will tell urban audiences of the fine job farmers have been doing for them.

By dispelling urban misconceptions about the farmer, and showing the farmer's contribution in a positive way, the new NPFI film will do a broad public relations job in explaining agriculture to urban audiences, as well as impressing them with the importance of fertilizer in producing an abundant food supply.

The NPFI staff right now is preparing to spark a widely expanded community soil fertility program by assisting Land Grant Colleges and local communities to establish the programs. The soil fertility programs achieved stellar success last year in increasing the use of fertilizers and in boosting the net incomes of farmers who took part in the programs.

* * * * *

Senator John Stennis, of Mississippi, has been supporting appropriations which will have a profound effect upon both fertilizer and pesticides sales in the booming forestry market. Earlier this year Agriculture Secretary Ezra Taft Benson proposed a "Program for the National Forests" and asked for a budget of $41,350,000 to carry it out.

As presented in testimony before the Senate Appropriations Committee by Assistant Agriculture Secretary Erwin L. Peterson and Forest Service Chief Richard McArdle, the program has a number of long-range objectives. Among them are specific goals for all renewable resources of the National forests — water, timber, range, recreation, and wildlife.

Short-range objectives include increasing the annual yield of timber, stabilizing soil on critical watersheds, improving forest management, providing additional forest

area for recreation, provision of needs for additional fish and wildlife, and construction of more adequate access roads.

In Senator Stennis's words, "Critical protection problems would be met by stepping up the activities in fire, insect, and disease control." The Senator added that he had written to more than 50 of the nation's outstanding conservation leaders and they all agree that basic research on forestry problems must be expanded if our forests are to satisfy the growing demands being put on them.

Senator Richard L. Neuberger, of Oregon, added his voice to support the program for greater appropriations, particularly for basic research on forestry problems. The outcome was that the Senate approved some $22 million in supplemental appropriations for the Forest Service for fiscal 1960. Of this total, $1,500,000 was earmarked for expanding current research and for building additional research facilities. Research, thus, would be expanded on means to control the big three hazards to forests—fire, insects and disease.

Since the House had not passed any similar supplemental appropriations, the matter went into conference. Though Congressional actions are largely unpredictable, the likelihood expressed by those close to the problem is that some supplemental money will be voted for this program before Congress ends the 1959 session.

More than any other single measure in Congress, this supplemental appropriations measure is likely to go farther toward getting the question of pesticides and wildlife off on a positive direction than any other. As we pointed out last month, the real question is how to develop means for providing adequate fish and wildlife along with adequate food and fiber and recreation for our growing population.

Pesticides have an exceptionally important role in this program. They have to be used both to control insects and diseases, and improve wildlife habitat. Fertilizers, as well, play a significant role. For as forestry moves farther in the direction of tree farming, fertilization of forests becomes more essential to high yield.

In addressing the Senate on the "Program for the National Forests," Senator Stennis concluded with these words: "I do not see how the executive branch of the Government can fulfill its obligations without taking another look at these essential, demanding, and real emergency needs in the great field of our resources, and joining hands with Congress in starting the program at the earliest possible date."

Wildlife organizations, which have paid no attention to the Senate's approval of supplemental appropriations for forest research, have been putting all their effort on passage of S. 1575 and H.R. 5813. These are companion bills seeking to increase U. S. Fish and Wildlife Service's pesticides-and-wildlife research budget from $280,000 to $2,565,000 a year.

During a hearing before the House Subcommittee on Fisheries and Wildlife Conservation headed by Congressman Frank B. Boykin of Alabama, nearly all major wildlife organizations expressed themselves as favoring the measure. The only dissenting voice was that of NAC Executive Secretary Lea S. Hitchner, who told the Subcommittee via a statement filed with the Committee that any research by U. S. Fish and Wildlife Service should be integrated with pesticides research now being conducted by USDA, U. S. Public Health Service, and industry.

Even more significant, Lea Hitchner pointed out that so many conflicting and unsubstantiated statements have been made concerning pesticides and wildlife that the National Academy of Sciences is planning to appoint an impartial scientific committee to review the scientific findings and make a reliable report.

In effect, Lea Hitchner urged the Subcommittee to go slow in approving a ten-fold increase in research expenditures by U. S. Fish and Wildlife for pesticides and wildlife studies until the National Academy of Sciences committee can report, and until plans are made to integrate the U. S. Fish and Wildlife Service research with that of other government agencies dealing with the same basic problems.

* * * * *

Pesticide manufacturers interested in forestry and in wildlife will want to see the Weyerhaeuser Company's new film on "Tomorrow's Trees."

Within a brief 35 minutes, the film presents the story of modern tree farming. Problems caused to seedlings and young trees by marauding field mice, rabbits and deer are included. The even greater dangers of forest fire, insects, and diseases are hammered home to viewers. The film emphasizes that if we are to use land effectively to grow trees and maintain forest areas for hunting, fishing, and other recreation, insects and diseases must be controlled.

Conservationist and wildlife officials saw the film at a preview in Washington recently. Their reactions ranged from admission that this was a fair and good presentation of the need for tree farming to enthusiastic acclaim. There was one missing factor, however: representatives of the most radical wildlife groups were not present.

The Weyerhaeuser Company is to be congratulated for producing an excellent film which deserves and, we believe, will gain a school and civic group audience running into the tens of millions over the next few years.

* * * * *

Marketing and wildlife will be given top billing at NAC's upcoming annual meeting at French Lick, Indiana, October 21, 22, and 23. The first day's sessions will feature two presentations on sales and marketing and advertising and promotion of pesticides. The first day also will include a panel of nation-

(*Continued on Page* 139)

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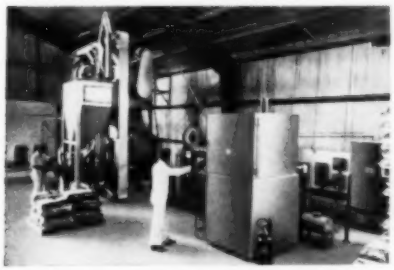

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DROPPED CAN crashes through ordinary paper which lacks stretch, but bounces off CLUPAK paper of equal basis weight. Unlike creped paper which stretches easily, every fiber of CLUPAK paper resists as it stretches.

NEW TOUGHNESS, FLEXIBILITY CUTS PACKAGING COSTS, INSPIRES NEW PRODUCTS.

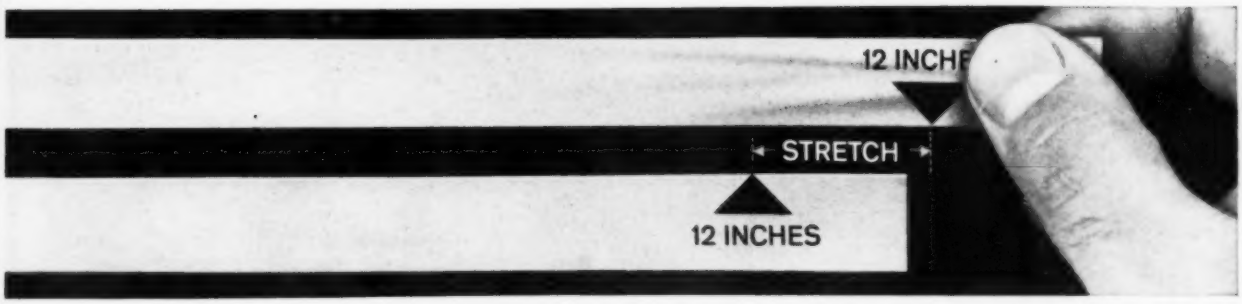
Until the invention of CLUPAK Extensible Paper, paper has just been strong. It resisted the energy of impact until it ripped or tore. But now paper can also be *tough*. CLUPAK paper has a built-in stretch that lets it absorb energy that otherwise would cause it to break.

Because CLUPAK can be almost any type or basis weight

MULTIWALL SACKS perform strikingly better when made with CLUPAK paper. Bottom sacks here carry 6,000 pound weight without failing, resist roughest handling. Basis weight can often be reduced substantially, cutting sack cost.

GROCERY BAG of ordinary kraft splits, spills contents after drop, but the much tougher CLUPAK paper bag absorbs shock, remains intact.

STACK COMPARISON shows how CLUPAK flexibility enables multiwall sacks to fill better, for many products, saving up to 25% of space needed for storage and shipping.



STRETCHES

of paper, with varying controllable degrees of stretch, it transforms conventional paper into virtually a new material—one with almost unlimited possibilities.

CLUPAK stretch is already giving multiwall sacks, grocery bags, magazine wrappers, paper-base pipe and laminates, shipping containers and many other products spectacularly better performance and lower costs. And the flexibility of CLUPAK papers can also mean startling savings and advantages in many uses and situations.

But these applications of CLUPAK Extensible Paper are only the beginning. CLUPAK is the most exciting new word in paper. The "give" it adds to paper opens a new era, invites a thousand new products and design improvements. We suggest you investigate the potential of CLUPAK for your business. It will pay you to consult your paper supplier. Our licensees, who make CLUPAK paper, are listed below. ***Clupak, Inc., 530 Fifth Avenue, New York 36, N. Y.***

UNIQUE TEST machine measures and graphs far greater toughness of CLUPAK paper. Printability, surface friction, porosity and other properties of CLUPAK paper can be controlled as with conventional paper.

KEY FACTS FOR BUYERS

1. CLUPAK kraft is the same as ordinary kraft except that it is stronger, tougher and more flexible. Its built-in stretch accommodates strains that break ordinary kraft.
2. This increased toughness, for example, allows multiwall sack users to increase strength yet decrease the number of plies with resulting economies.
3. CLUPAK, INC. conducts research and development activities and advises licensees on technical matters.
4. CLUPAK, INC. permits the use of its trademark only on paper which meets this company's rigid toughness requirements.

EXTENSIBLE CLUPAK PAPER

TRADEMARK "CLUPAK" is your assurance that paper will deliver remarkable CLUPAK benefits. Look for it, expect it.

BE SURE TO LOOK FOR THIS TRADEMARK

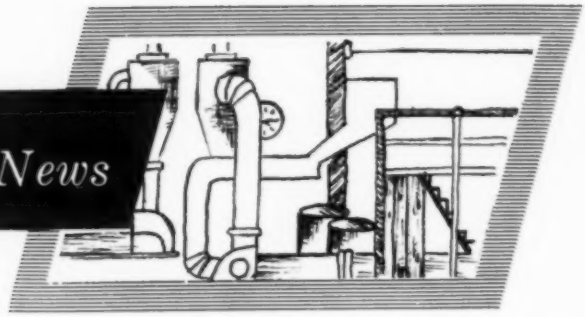
EXTENSIBLE **CLUPAK®** PAPER *

**Clupak, Inc.'s trademark for extensible paper manufactured under its authority.*

You can now get CLUPAK paper and products made with CLUPAK paper from

ALBEMARLE PAPER MANUFACTURING CO.
CALCASIEU PAPER CO.
CANADA PAPER CO. *(Canada)*
CROWN ZELLERBACH CORP.
CONTINENTAL CAN COMPANY, INC.
DYNÄS AKTIEBOLAG *(Sweden)*
HUDSON PULP AND PAPER CORP.
INTERNATIONAL PAPER CO.
ST. LAWRENCE CORP., LTD. *(Canada)*
ST. REGIS PAPER CO.
UNION BAG-CAMP PAPER CORP.
WEST VIRGINIA PULP AND PAPER CO.

Fertilizer Views and News



The Mechanism of the Growth and Formation of Granules

SOME interesting thoughts on the mechanism of granule formation and growth were presented by D. M. Newitt and A. L. Papadopoulos at a meeting of the Fertilizer Society in London, earlier this year. The following is a summary of their comments, from a report published in *Chemical Age*.

The formation of granules requires the presence of cohesive forces which owe their origin to the surface tension of the liquid and capillary action of the particle assemblies. When the granules are dried, another set of forces due to adhesion of solute material deposited between insoluble particles comes into play. Both, are important in the granulation of fertilizers.

With regard to distribution of moisture in a granule composed of a large number of spherical particles of approximately uniform size, three separate conditions may be distinguished. When moisture content is low, moisture will collect at the points of contact between the particles in the form of discrete lens-shaped drops with concave free surfaces (pendular state). Surface tension forces holding the particles together have been found to be quite considerable. When the pores of the granule are full, the state is known as the capillary state. Any removal of water from a saturated granule produces a curvature of the water surface in the interstices of the surface layer of particles and will set up suction potential. This is a measure of the resultant forces tending to hold the particles together, and hence of the mechanical strength of the granule.

There is an intermediate condition known as the funicular state in which capillary forces are operative although the pores of the granule are not fully saturated.

With formation of pendular bonds, granules grow by adhesion of individual moist particles, but have little mechanical strength. If capillary forces are operative, two granules can coalesce and, by the rolling action of the granulation, form a mechanically strong spherical granule.

The suction potential, and hence granule strength, can be measured experimentally or, for particles of uniform size, may be calculated from the relation

$$Pe = x \frac{1-E}{E} \frac{T}{r} \quad (1)$$

where x is a dimensionless factor depending upon type of particles, T is the surface tension of the liquid in the granules, E is the porosity of the granules and r is a linear dimension representing size of the particles.

From equation 1, it is evident that the strength of a granule depends *inter alia* upon the surface tension of the liquid component.

Optimum Moisture Content. Critical moisture content will vary with the porosity of the granule. Examination of the variation of strength of granules made of fine sand and water, with moisture content, has indicated the importance of ascertaining and employing the optimum moisture content in granulating operations. The effect of other variables such as drum loading and the rate of revolution is also of considerable importance.

Effect of solutes on granulation. When the binding liquid of a granule contains solids in solution the strength of the moist granule will be modified by any change in the surface tension due to the solute. In the case of nitrogen-phosphorus-potassium fertilizer the change is unlikely to be large.

Examination of rate of drying of a granule (composed of mixed fine silt and water) has shown that in the initial stages of drying, the rate remains substantially independent of moisture content. At a certain critical moisture content, the rate diminishes rapidly with decreasing moisture content until a second critical is reached. The rate diminishes as drying proceeds until equilibrium moisture content is reached.

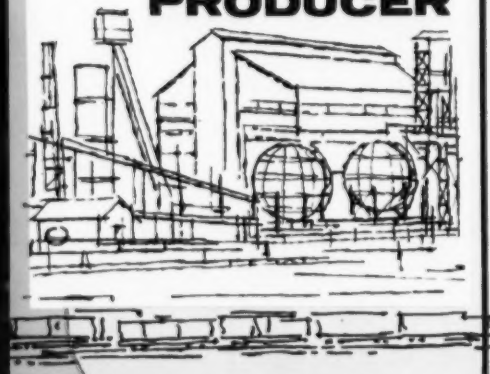
The drying rate curve can be interpreted in the light of what is known as the capillary theory of drying. Interpretation of this curve provides a clue to the effects produced on granules by the presence of solutes. Thus, during the period when liquid is moving to the surface of the granule and evaporating, the solute will be deposited at or near the surface. When the average moisture content falls below the second critical point, liquid movement ceases and remaining solute will be uniformly distributed in the interior of the granule. Such a granule will not have a homogeneous structure.

Examination of salt distribution in a granule moistened with a saturated solution and dried at 118°C has shown that most of the salt accumulates in the outer layers

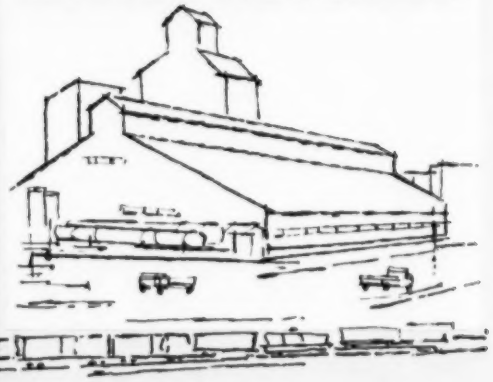
(*Continued on Page* 128)

BRADLEY & BAKER SALES COVERAGE BENEFITS BOTH:

BASIC MATERIALS PRODUCER



FERTILIZER MANUFACTURER



- PROMPT NATIONAL DISTRIBUTION SERVICE
- EXTENSIVE EXPERIENCE IN PLANT FOOD FIELD
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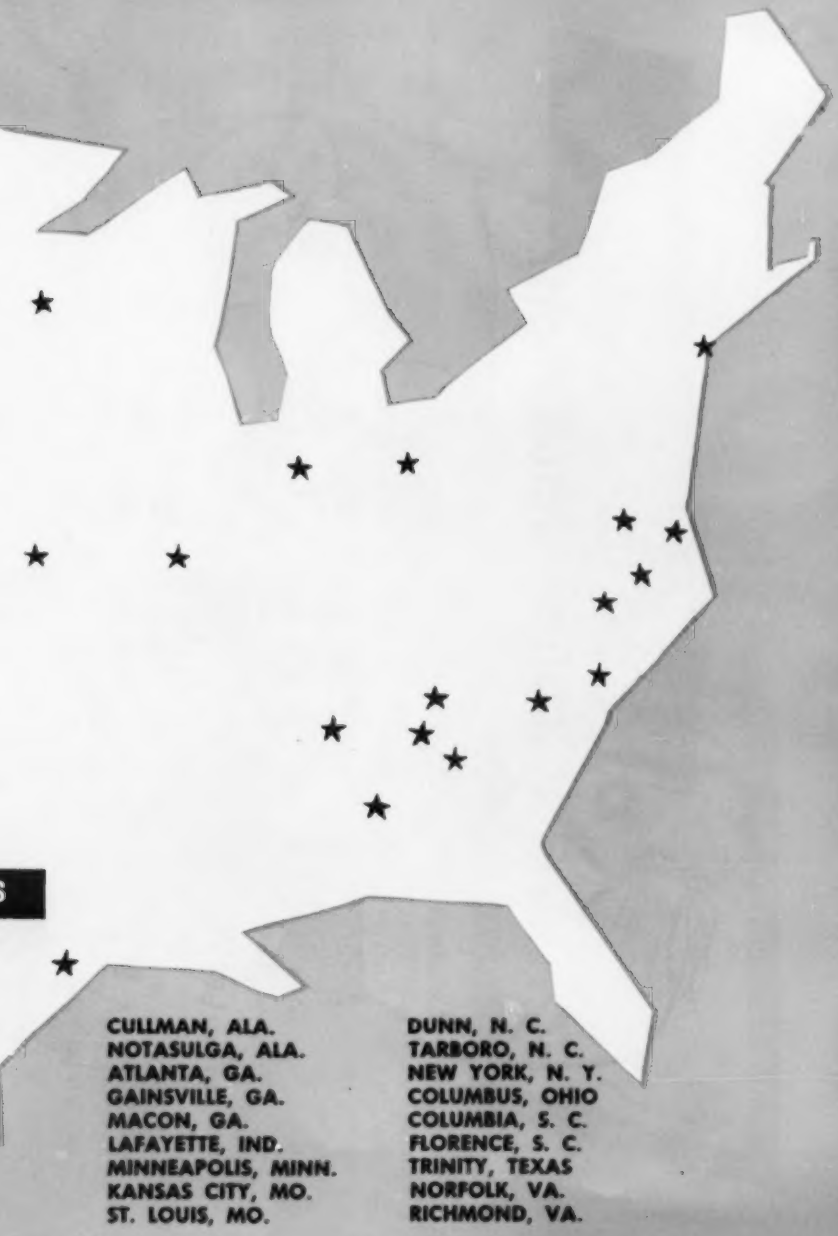

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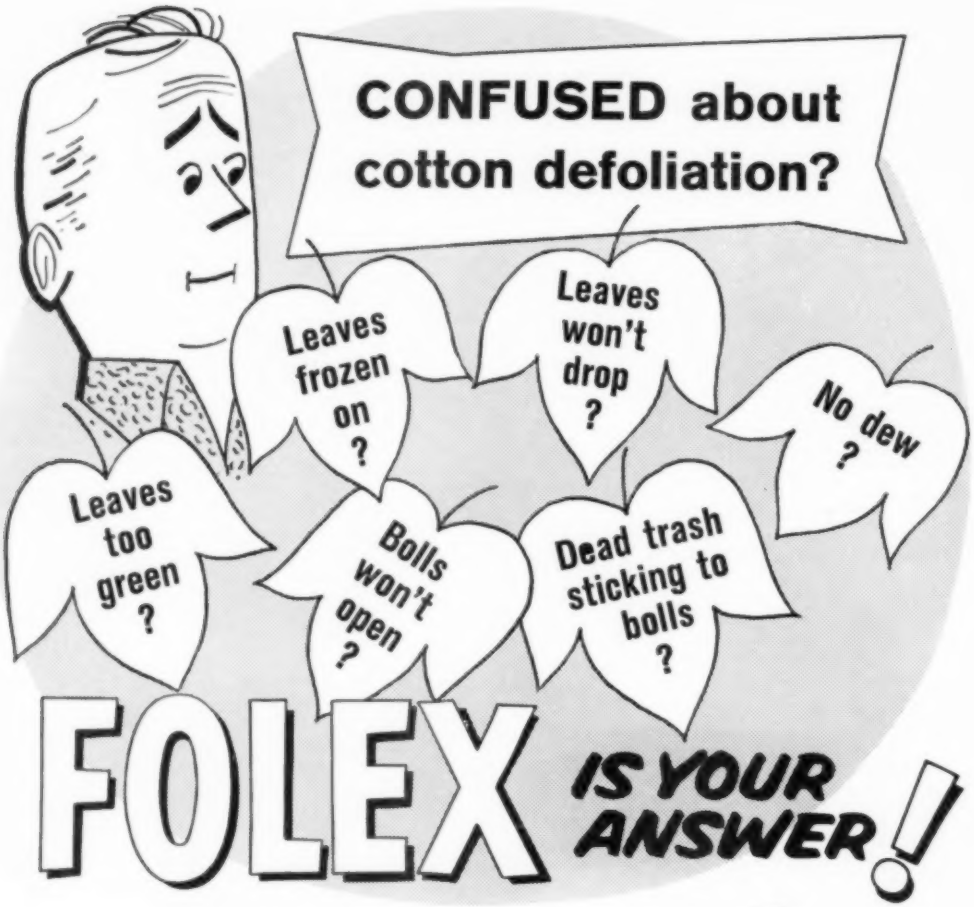

Now you can get reliable and consistent cotton defoliation with V-C® FOLEX. This easy-to-use product provides the best way to defoliate all your cotton.

Quick and effective FOLEX drops the leaves so they fall to the ground. BIG OR SMALL, THE LEAVES ALL FALL. No frozen leaves or dried trash to make picking hard and lower your grade!

No special fixing, no pre-mixing. Just pour liquid FOLEX into the spray tank as you fill it. No need for dew to activate FOLEX. It works fast and works well. Leaves absorb FOLEX fast, so you get effective leaf drop even when rains come within half an hour after application. Get FOLEX today and be ready for a bigger, cleaner harvest.

FOLEX is a product of

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NEWS about the TRADE

Heads Ashcraft-Wilkinson

Trenton R. Tunnell has been named president of the Ashcraft-Wilkinson Co., Atlanta, Ga. He succeeds Van W. Wilkinson, who has been made vice-chairman of the board.

Formerly executive vice-president, Mr. Tunnell has spent his entire business career with Ashcraft-Wilkinson since joining the company in 1920.

•

C-VPFA Lists Meeting Dates

The annual meeting of the Carolinas-Virginia Pesticide Formulators Association will be held at the Carolina Hotel, Pinehurst, N.C., Dec. 1 and 2. Registration for the meeting will take place Monday afternoon, Nov. 30.

•

New Cyanamid Appointments

Frank H. Cappy, advertising manager for the American Cyanamid Co.'s Agricultural Division, has been assigned additional responsibilities for public relations and packaging development.

Appointed to other newly-created posts were: R. G. Tousey, phosphates and nitrogen department; E. B. Shaw, pesticides; and S. B. Bromley, animal industry products.

•

House OK's Senate Amendment

The House of Representatives has given final approval to a Senate amendment to H. R. 6136S and the bill was sent to the White House for the President's signature last month.

The bill is an amendment to the Federal Insecticide, Fungicide, and Rodenticide Act that will bring nematocides, plant regulators, defoliants, and desiccants under the provisions of that law. The Senate amendment was of a technical nature and corrected a citation in the bill.

•

Smith-Douglass OK's Merger

Stockholders of the Smith-Douglass Co., Norfolk, Va., last month voted to approve a merger with the Smith Agricultural Chemical Co., Columbus, Ohio. Both firms produce fertilizers and chemicals for farm and non-farm use.

Miller Products To Expand

Miller Products Co., formulators in Portland, Ore. has purchased a 60,000 square foot concrete and steel building and 5½ acre site in Portland, Oregon, as part of a major expansion program.

Roy E. Miller, president, said that the move to the new building will get under way this month and is expected to be completed by the first of the year. A separate formulation building 120x200 feet will also be constructed on the site.

NAC Asks Congress To Look At Both Sides

The National Agricultural Chemicals Association has asked Congress that any research programs that may be developed to study the effects that insecticides have on fish and wildlife be coordinated with those now being carried on by the Department of Agriculture, Public Health Service, Food & Drug Administration, land grant colleges, and with those of private industry.

L. S. Hitchner, executive secretary of the NAC, made the request in a statement filed with the Senate Committee on Interstate and Foreign Commerce and the House Committee on Merchant Marine and Fisheries. The two committees last month held public hearings on Senate Bill S.1575 and House Bill H.R. 5813, which would increase present annual appropriations of about $280,000 (authorized by Congress last year to more than $2,500,000 for pesticide-wildlife research under the direction of the Fish and Wildlife Service of the U. S. Department of the Interior.

Mr. Hitchner cautioned that a project cannot be extended from $280,000 a year to more than $2,500,000 a year in such a short period of time without waste.

Lansing A. Parker, speaking for the Bureau of Sport Fisheries and Wildlife, USDI, said that last year's $280,000 ceiling on investigations was entirely inadequate. He recommended that the bill be amended to eliminate any fixed amount as the authorized ceiling. Mr. Parker told the committees that the logical approach to financing the studies is through the preparation of budget submissions developed in accordance with the needs of a sound, well-planned research program.

The NAC asked the committee to call on the Department of Agriculture and the Department of Health, Education, and Welfare for information on their views on future research programs before acting on the legislation. There was no immediate reaction from the committees to this request.

Take those big preseason savings on LION® E-2 now!

It's the one and only ammonium nitrate you can safely store for big spring markup and extra profit! Lion E-2 is free-flowing when you get it... free-flowing when you sell it... no matter how long you store it!

NO CAKING... GUARANTEED. Lion E-2 prills won't break down, crumble or cake under the heavy weight of stacking in shipment or storage. E-2 is free of dust and fines ... not affected by extreme temperature changes or humidity. You and your customers can buy now, store safely until used. Guaranteed storage-stable.

EASY-TO-HANDLE BAGS. Lion E-2 multiwall bags are specially coated with Monsanto Syton®—the antislip agent that lets you stack Lion E-2 higher ... move it faster ... handle it easier. It helps you save time, work and space ... reduces material losses through breakage due to slippage.

TAKES LESS STORAGE SPACE. Lion E-2 has the greatest density of any ammonium nitrate on the market. It's less bulky ... takes 20% to 25% less storage space. It saves you needed floor area. It isn't necessary to spread out E-2 in smaller stacks. With E-2 you stack higher utilizing all available storage area, without fear of caking. You can *safely* stack E-2 higher.

MONSANTO CHEMICAL CO.
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St. Louis 66, Missouri

Monsanto®

NEW LION E-2

Always stores...

Always pours

Photo taken at warehouse shows Lion E-2 stored in huge quantity (rows are stacked 27 bags high) with no danger of caking, shifting or sliding. Winter moisture won't cake Lion E-2 . . . not even the bags on the bottom. Lion E-2 won't cake in your storage area either . . . **we guarantee it.**

Order Lion E-2 Now . . . Order Big . . . Cash in Big!

Control Officials To Meet

The NPFI chemical control research project will be discussed by Dr. A. J. Duncan of Johns Hopkins University, Baltimore, Md., at the meeting of the Association of American Fertilizer Control Officials, Oct. 15 and 16, at Washington, D. C.

Other speakers will be: Dale C. Kiefler, Smith-Douglass Co., Norfolk, Va.; M. B. Rowe, Virginia Department of Agriculture; R. C. Crooks, Florida Department of Agriculture; and Dr. Stacy B. Randle, New Brunswick, N. J.

•

AAC Agronomists Move

J. H. Gilleland, former staff agronomist at the American Agricultural Chemical Co.'s New York office, has been named regional agronomist at Humboldt, Iowa, covering Iowa and Minnesota.

At the same time, R. D. Sibley, Jr., formerly staff agronomist in New York, was named regional agronomist for New England and eastern New York, including Long Island. He is located at North Weymouth, Mass.

•

Spencer Elects Denton

John C. Denton (left), formerly vice president—Agricultural Chemicals Division, has been elected president of the Spencer Chemical Co., Kansas City, Mo. He is replaced as vice president by Byron M. Kern (right), formerly general manager of production—agricultural chemicals.

Mr. Denton succeeds Kenneth A. Spencer, who became chairman of the board and chief executive officer of the company. Mr. Denton joined Spencer in 1952. Mr. Kern has been with the company since 1946.

•

National Safety Congress

The 47th annual National Safety Congress and Exposition will take place Oct. 19 to 23 in Chicago. Sessions on farm safety will be held in the Palmer House.

SW Branch Meeting Feb. 8

The Southwestern Branch, Entomological Society of America, will meet, Feb. 8-9, at the Hilton Hotel, El Paso, Texas.

•

Realign Plant Food Sales

The Plant Food Division of the International Minerals & Chemical Corp., Skokie, Ill., has realigned its sales organization and production facilities in seven central and south-central states.

The Cincinnati area (Ohio, southern Indiana, and Kentucky) has been extended to include eastern Tennessee and southwestern Virginia.

The Tupelo, Miss., area (Alabama, Mississippi, southwestern Tennessee) has been extended to include western Tennessee and western Kentucky.

In the Atlanta area, (Georgia and North and South Carolina border counties) district sales offices have been opened in Americus and Tifton, Ga., replacing a district office in Albany, Ga.

Alexander Fleck To Retire

Sir Alexander Fleck will retire next February as chairman of the board of Imperial Chemical Industries, Ltd., (England) after 44 years of service with the company and its predecessors. Stanley Paul Chambers, a deputy chairman, will succeed him as chairman.

•

NE Weed Control Conference

The 14th annual Northeastern Weed Control Conference will be held in the Hotel New Yorker, New York, on Jan. 6, 7, and 8, 1960. The schedule follows the pattern of previous meetings with general interest talks and basic research papers on the first day, and sectional meetings on the second and third days.

W. E. Chappel, department of plant pathology and physiology, Virginia Polytechnic Institute, Blacksburg, Va., is chairman of the program commitee.

•

Growers Discuss MH-30

At a meeting called by the Ontario Tobacco Growers Marketing Board in Canada in late July, the use of MH-30 on this year's crop of tobacco was discussed. Represented at the meeting were the tobacco buying companies, the Naugatuck Chemical Division of U. S. Rubber (producers of MH-30), the Federal and Provincial Departments of Agriculture, and the directors of the Tobacco Marketing Board.

The Naugatuck representatives said that MH-30, when used in accordance with directions, will produce burley tobacco that is equal in quality to that of hand-suckered tobacco and that this tobacco will not differ significantly in taste or aroma. Rather than being a threat to burley quality and the burley market, Naugatuck said MH-30 actually is a boon to the tobacco grower. It cuts cultivating costs and increases average yields 10 to 15 per cent through effective control of sucker growth.

The buyers at the meeting, however, were opposed to the use of MH-30. They sail that Canadian manufacturers can make a cigarette that is more satisfying and more acceptable from tobacco that has not been treated with MH-30.

After the buyers had been heard from, the Marketing Board said that, as long as the buyers want tobacco that has not been treated with MH-30, and since export sales need to be expanded, the board has no other course when offering tobacco for sale than to mark the tobacco on which no MH-30 has been used.

U. S. Borax Net Income Up

The United States Borax & Chemical Corp. net income of $1,676,029 for the nine months ended June 30, 1959, represented an increase of 213 per cent over net income for the comparable period a year ago.

The company had reported net income of $1,493,061 for the first nine months of fiscal 1958 when start-up expenses at a new borax plant at Boron, Calif., adversely affected earnings.

Fertilizer Is Not Explosive

The Manufacturing Chemists' Association has announced that ammonium nitrate fertilizer was not involved in the explosion of a truck last month in Roseburg, Ore. Early newspaper reports of the blast, which resulted in a number of casualties and heavy property damage, had attributed it at least in part to a shipment of fertilizer grade ammonium nitrate. Many drew a parallel to the Texas City incident of 1917.

The MCA said that the cargo in the truck which exploded was two tons of forty per cent dynamite and four and one-half tons of "Car-Prill". "Car-Prill" is a prepared blasting agent made by an explosives manufacturer of Tenino, Wash. The MCA report goes on to say that most of the new blasting agents in use today are an admixture of ammonium nitrate with some combustible materials, but are not ammonium nitrate fertilizer. The National Plant Food Institute also is circulating a similar statement to answer many questions that are being raised concerning the incident. The Interstate Commerce Commission is holding hearings on the matter.

•

Lynch is Sales Manager

David W. Lynch has been named to the newly-created position of sales manager - national accounts by the Vulcan Steel Container Co., Birmingham, Ala.

Mr. Lynch, who is widely acquainted in the agricultural chemical and chemical specialties industries, makes his headquarters in Birmingham. He will contact all multiple-plant companies that use steel pails and drums.

•

Elected To V-C Board

Charles T. Harding, executive vice president of the Virginia-Carolina Chemical Corp., Richmond, Va., has been elected to the company's board of directors. At the same time, the board elected Dr. William P. Boyer vice pres. and Wallace T. McKeel treasurer.

To Discuss Fertilizer

Recent advances in fertilizer technology and soil testing will be discussed by the American Chemical Society's Division of Fertilizer and Soil Chemistry during the society's 136th national meeting which opens in Atlantic City, N. J. Sept. 13.

Thirty-three technical reports by authorities in the fertilizer field have been scheduled, beginning Sept. 14 and continuing through the 17th. All sessions of the division will be held in the Haddon Hall Hotel.

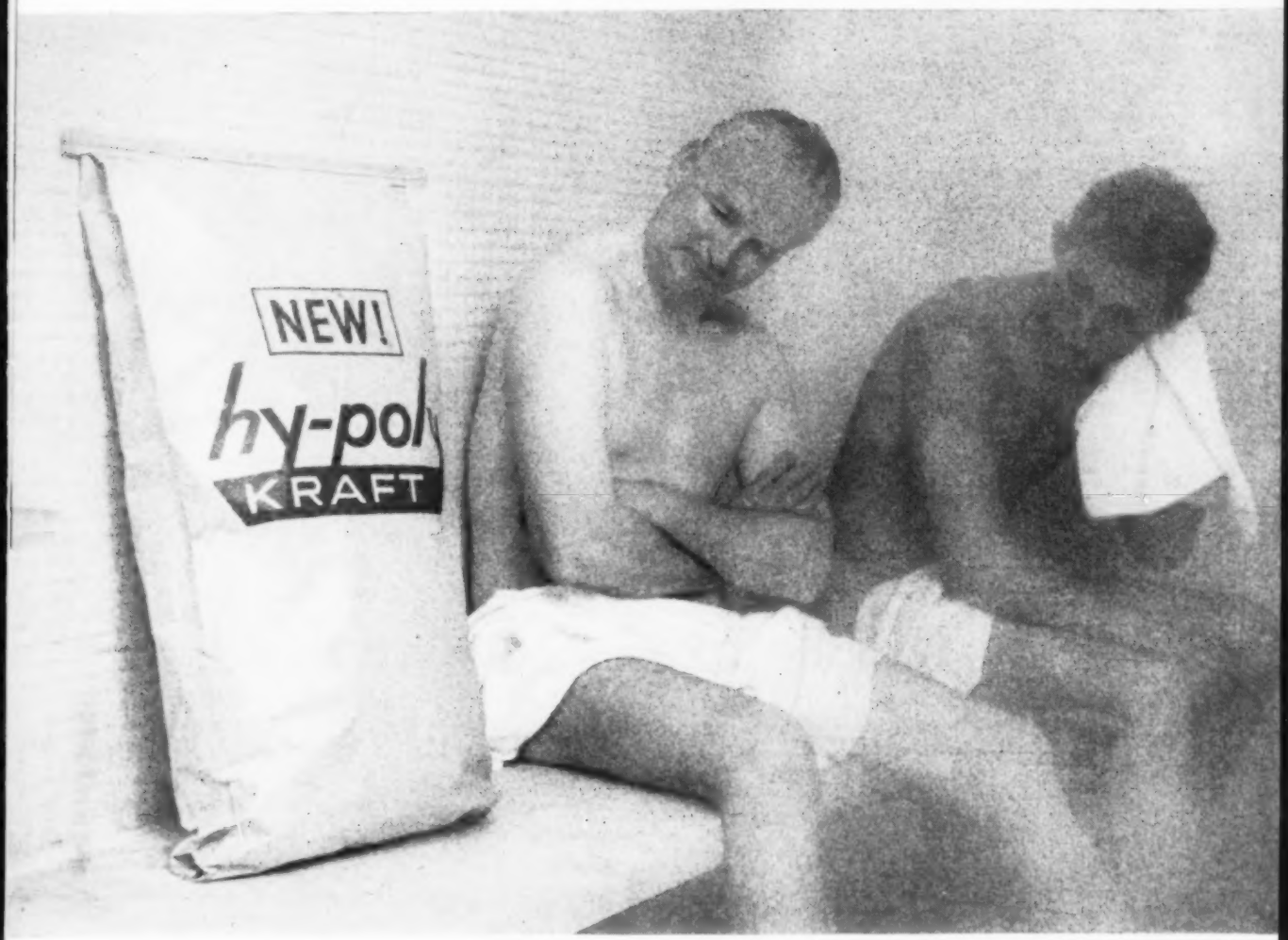
Among the speakers will be Bruce D. Cloaninger, secretary-treasurer of the Association of American Fertilizer Control Officials.

•

Expands Chlordane Staff

The Velsicol Chemical Corp.'s Chlordane insecticide marketing staff has been expanded with the addition of two marketing specialists. The new men are Edward Michael O'Leary and Philip M. Olson.

Now International Paper saves you $5 to $16 per thousand PE multiwalls!



Read why new humidity-proof "Hy-poly" kraft makes medium and low-density polyethylene sheets extravagant!

THE multiwall bag you see taking a Turkish bath in our picture contains *calcium chloride*.

We steamed this new Bagpak® multiwall in 95% relative humidity at 120° F. for 48 hours. (Unprotected, under these conditions, this chemical takes on 2½ times its weight in water in about an hour!)

But when we opened up the bag, the thirsty crystals spilled out as though they had been stored on the Sahara!

And Bagpak's new Hy-poly kraft *saves you money*. You stand to save from $5 to $16 per thousand multiwalls!

That's because new Hy-poly kraft is so superior to medium and low-density PE sheets that you get equal, if not greater, moisture-vapor protection from a coating approximately *half as thick!*

Extensive laboratory tests prove that this dramatic new barrier sheet is superior in *every way*. Write us today for samples.

See how calcium chloride protected by Hy-poly kraft Bagpak, pours after 48-hour steam bath!

Bagpak Division **INTERNATIONAL PAPER** New York 17, N.Y.

Gilman Paper Company To Build Converting Plant In Georgia

The Gilman Paper Co. has announced plans to erect a modern converting plant of approximately 300,000 square ft. in St. Marys, Ga. The new building will house the combined multi-wall bag plants, grocery bag plants, and other converting operations of the Kraft Bag Corp., subsidiary of the Gilman Paper Co.

The new plant will be served by the St. Marys Railroad which operates between St. Marys and Kingsland, Ga., where it connects with the Seaboard Airlines RR. The St. Marys Railroad also serves the nearby Kings Bay Terminal, which is capable of handling ocean going vessels.

The new plant will receive its paper from the St. Marys Kraft Corp., a wholly-owned Gilman subsidiary.

IMC Buys Miami Fertilizer

The International Minerals & Chemical Corp., Skokie, Ill., has purchased the Miami Fertilizer Co., Treblin, Ohio. The company is the producer of "Big M" dry granular fertilizers, sold principally in the Miami Valley area of Ohio.

Charles F. Martin continues to manage the plant and Clarence Crickmore is in charge of production. The facilities include a mixing plant and granulating unit.

•

Dr. Reiner Bonde Dies

Dr. Reiner Bonde, 63, an authority on potato diseases and their control, died of a heart ailment July 13 in Presque Isle, Maine. He had served for 35 years with the Aroostook Experimental Farm operated by the University of Maine.

•

Southwest Fertilizer Conf.

An educational program at the Southwestern Fertilizer Conference and Grade Hearing, Galveston, Texas, July 15 to 18, included talks by Dr. Russell Coleman and R. L. Beacher of the National Plant Food Institute, who outlined southwestern activities of the NPFI.

They emphasized the progress of intensified county soil fertility programs in Arkansas, Texas, and Louisiana.

Other speakers included: Ralph Johnson, Georgia Extension Agronomy leader, who reported on the Georgia fertilizer educational program; Dr. J. Q. Lynd, Oklahoma State University agronomist, who presented a slide talk and film of pasture fertility research in Okalahoma; and Jack Timmons, manager of Shreveport radio station KWKH, who talked about the need for better salesmanship.

Next year's conference is scheduled for the Galvez Hotel in Galveston, July 27 to 30, 1960.

•

Fungicide Colloquium

A Fungicide Colloquium is on the program for the annual meeting of the American Phytopathological Society to be held in conjunction with the American Institute of Biological Science at Pennsylvania State College, University Park, Pa., Aug. 30 through Sept 2.

The current status of federal controls on fungicides will be discussed by J. A. Noone of the National Agricultural Chemicals Association. Dr. Carroll Cox and Dr. Hugh Sisler, U. of Maryland, will outline present thinking on the mode of action of fungicides.

The present status of the use of foliar bactericides on vegetables will be discussed by Dr. Robert A. Conover, U. of Florida.

3 MEN DO WORK OF 4, and cut material handling costs 15%

in switch to Michigan Tractor Shovels

By equipping standard 16 cu ft Tractor Shovels with ¾ yd buckets, Growers Fertilizer Co-operative, Lake Alfred, Florida, has cut handling costs 15 per cent.

Growers' problem had been a common one . . . how to put greater efficiency into a system where weighing, mixing, and truck loading all were completely automatic. Only in such Tractor Shovel operations as unloading box cars, storing material, and feeding hoppers could there be much improvement.

With this limitation, plant manager Ed Shores' first thought was to get bigger machines. It was about time to trade in his four old 15 cu ft Tractor Shovels anyhow. But an increase of even one size *range* would keep the Tractor Shovels from readily passing through aisles, box car doors, and among some of the 38 bins (which ranged from 40 to 500 tons in capacity).

Then, a different *make* of Tractor Shovel came to mind. This machine—a 16 cubic ft power shift-torque converter Michigan Model 12B—would help boost production simply by preventing the end-of-shift fatigue that comes from constant clutching and declutching. Too, its extra cubic foot of capacity could up production—though only another 100 lbs or so per load.

That's when the key idea was born. Fertilizer is, after all, a relatively light material—the heaviest Growers Co-op handles weighs 110 lbs per cu ft. Perhaps the Michigan Model 12B could swing a bigger bucket, thought Mr. Shores. How about the standard Clark-built ¾ yarder? Fully heaped, it would carry 2230 lbs—470 lbs (27%) more than could the 16 ft bucket. Yet, its load would be well under rig's lift-and-carry capacity of 3,000 lbs. And its extra width, 4 inches, would cause no maneuverability problems.

A three-day on-the-job trial resulted. Michigan and the ¾ yd bucket performed "with highest honors." Loads weighed out at 2200 lbs or better. Each 40 ton box car was unloaded in about 1½ hours. Feeding the hopper from a stockpile 40 feet away, the 12B delivered 77 tons of fertilizer per 50-minute hour. With the fatigue factor reduced, operator made more runs in a day.

Result . . . the Co-op ordered three new Michigans to replace the four old machines.

Today, the combination of eliminating one Tractor Shovel and getting more production from each machine has provided the company with an over-all cost saving of 15 per cent! Yearly output, with only 12 men, is up to 100,000 tons, 700 grades of fertilizer, per season.

Perhaps the Model 12B Michigan can give you similar economies. Test one in your plant for proof—using the size bucket, 6 to 27 cubic ft, which best fits your material, job conditions, and production needs. Write us to arrange the details.

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Canadian Clark, Ltd.
St. Thomas, Ontario

CACA Lists Program

Dr. F.E. Webb, Forest Biology Laboratory, Canada Department of Agriculture, will discuss air spraying of forestlands as one of the speakers at the 7th annual meeting of the Canadian Agricultural Chemicals Association, Sept. 20 to 23, at the Chateau Frontenac, in Quebec.

Other speakers include Charles Gagne, College St. Anne de la Pocatiere, who will speak on general farm economy in Quebec; and Andre Descheigny, Co-operative Federee de Quebec Bureau, who will discuss the pesticide market in Quebec. Also, Dr. Harold R. Baker, University of Sasketchewan, will moderate a panel on agricultural extension as it affects industry and the farmer.

Dr. C. H. Goulden, assistant deputy minister (research) Canada Department of Agriculture, will speak on departmental re-organization at a luncheon meeting. Bram Dees, president of Hardee Farms, will discuss the future of corporate farming and a panel will discuss Maleic Hydrazide.

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Agro-Forestry Meeting

The second annual Agro-Forestry meeting will be held Sept. 29 and 30 at Pringle Falls, Oregon. The meeting is intended to permit agronomists from college and industry to get together with foresters to exchange ideas on management and fertilization.

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Cyanamid Poster Campaign

The American Cyanamid Co.'s Agricultural Chemicals Division, New York, is conducting its first outdoor advertising campaign for Malathion.

The campaign is designed to reach cotton growers in 70 selected counties of Texas, Mississippi, and Arkansas. Throughout the summer, posters have been telling the story of the product's potency in safely eliminating boll weevils.

New Plant Growth Chemicals

Scientists from the U. S. and 16 other nations attended the fourth International Conference on Plant Growth Regulation last month at the Boyce Thompson Institute for Plant Research, Yonkers, N. Y.

During the meeting, the discovery of an entirely new class of plant growth chemicals, evidently unrelated to either the gibberellins or auxins, was reported. The new substances, a fatty alcohol called I-docosanol and a still not entirely identified fatty acid, were isolated in minute quantity from a half-acre crop of Maryland mammoth tobacco, according to a report by D. G. Crosby of Union Carbide Chemicals Co., South Charleston, W. Va., and A. J. Vlitos of Caroni, Ltd., Couva, Trinidad, B. W. I. Dr. Vlitos was on the Boyce Thompson staff when he did the research.

A full day of the four-day meeting was devoted to the gibberellins. Dr. P. W. Brian of Great Britain estimated that the gibberellins now have been found naturally in at least a dozen plants. Among practical applications that seem likely in the near future for the gibberellins, Dr. Brian said, are in the growing seedless grapes and in the manufacture of beer.

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Support Fire Ant Program

The Mississippi Farm Bureau Federation has announced that it is solidly behind that state's fire ant control program. Boswell Stevens, federation president, cited a survey of a similar program being conducted in Alabama and said that sportsmen have nothing to worry about as far as eradiction of game is concerned.

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Northwest Conference Jan. 20

The Northwestern Agricultural Chemicals Industry Conference, sponsored each year by the Western Agricultural Chemicals Association, will be held Jan. 20 and 21, 1960, in the Benson Hotel, Portland, Oregon.

Amchem Names Chisolm

Dan W. Chisolm, formerly southern district sales supervisor, has been named manager of farm chemical sales by Amchem Products, Inc., Ambler, Pa.

This appointment brings to three the total number of sales organizations in Amchem's Agricultural Chemicals Division. For the past 2½ years, Jack P. Taylor has been in charge of agricultural industrial chemicals sales, while Joseph H. Torchiana has supervised lawn and garden (small package) sales since Sept. 1958.

Mr. Chisolm joined Amchem as a salesman in April 1952.

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Begin Mexican Production

The Texas International Sulphur Co., Houston, Tex., has begun sulfur production at a rate of 9,000 tons per month at its wells at Texistepic on the isthmus of Tehuantipec in Mexico.

The company plans to raise daily production to 1,000 tons and is working on a process to extract sulfur from surface deposits.

•

Canadian Representative

R. Paul Suckling has been appointed Canadian representative for Velsicol International Corp., C.A. His territory includes all of Canada and his headquarters are at 2660 Peel St., Montreal.

In 1953, Mr. Suckling immigrated to Canada from England and has been with the McColl Frontenac Oil Co., Ltd., in Montreal.

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Eastern ESA Lists Speakers

Among the speakers at the thirty-first annual meeting of the Eastern Branch, Entomological Society of America, to be held Oct. 29 and 30 at the Hotel Chalfonte-Haddon Hall, Atlantic City, N. J., will be Dr. Herbert L. Haller, ARS, USDA, who will discuss his experiences with the recent agricultural observation team that toured the U.S.S.R..

A.W.A. Brown, University of Western Ontario, will discuss resistance to insecticides on a worldwide basis. Recent advances in pest control will be outlined by E. F. Knipling, USDA. Ordway Starnes, Rutgers University, will tell of the findings of Northeastern, Project 36—Pesticide Residues in or on Raw Agricultural Commodities.

Also scheduled to speak are P. W. Oman, president of the E.S.A.; Paul Mayfield, Hercules Powder Co.; and Ralph Neiswander, Ohio Agricultural Experiment Station.

Southern Weed Conference

Recent progress in the use of herbicides to control weeds in all phases of southern agriculture will be featured during the 13th annual Southern Weed Conference at the Vista Hotel in Biloxi, Miss., Jan. 20-22, 1960.

Dr. D. E. Davis of the Alabama Agricultural Experiment Station is serving as chairman of the program committee for the meeting.

Buys Fertilizer Plant

Agricultural Chemicals Ltd., Port Hope, Ontario, Canada, has purchased the factory and physical assets of Grand Valley Fertilizers Ltd. at Orangeville, Ontario.

With this addition, Agricultural Chemicals Ltd. now operates four fertilizer factories in Canada, located at Orangeville, Port Hope, and London, Ont., and at Fort Chambly, Quebec.

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CACA Office Moves

The national office of the Canadian Agricultural Chemicals Association now is located at 3405 Cote des Neiges Road, Montreal 25, Quebec.

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Stauffer Appoints July

Wilbur F. July has been placed in charge of advertising and promotion for the Agricultural Chemicals Division of the Stauffer Chemical Co., New York. Mr. July, who joined Stauffer in 1955, had been assistant to the agricultural chemical sales manager, Northeast area.

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European Technical Digests

The European Productivity Agency, 3 rue Andre Pascal, Paris 16, France, now is offering in the United States its publication, the *European Technical Digests*.

The publication is a monthly compilation of technical innovations appearing in the technical press all over Europe. It is printed in eight languages, including English.

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James Totman Resigns

James C. Totman, vice president of Summers Fertilizer Co., Baltimore, Md., and Northern Chemical Industries of Scarsport, Me., resigned July 31 from both companies.

He plans to move to Geneva, Switzerland, where he will represent American industries operating in Western Europe.

Soil Testing Campaign Is State-Wide Effort In Alabama

TYPICAL of programs conducted with the cooperation of the National Plant Food Institute and designed to increase the proper use of fertilizers is the 1959 Alabama educational program directed to Alabama county agents. The campaign is a state-wide effort by the API Extension Service, designed to increase soil testing as a guide to correct liming and fertilizing. It was put into effect early in 1959. Cooperating in the educational campaign have been fertilizer and lime companies, bankers, business groups, and others interested in agriculture. The Alabama Soil Fertility Educational Program is supported, in part, by a grant of $200 from the Southeastern Regional office of NPFI.

In a letter to county agents earlier this year, API director, P. O. Davis said, "If all of us work together with enthusiasm, we can help farmers whip low yields, which, if not whipped, will whip farmer profits. With higher yields, from enough acres, we can achieve the level of production essential for an adequate income."

To help county agents in the campaign, over 60 newspaper releases were provided dealing with: soil testing, lime, mixed fertilizer, fertilizer economics, nitrogen, water, fertilizer placement and crops, potash, hidden hunger, and turf. These stories were so written, that the county agent had only to fill in a minor number of "blanks" to adapt each story to local situations. The releases were suggested for use in special soil fertility editions or sections of local papers, for use in circular letters, for radio spots on local O.S.C. breaks.

A group of newspaper advertisements were also provided for use in special soil fertility editions or sections of local newspapers—with the suggestion that fertilizer companies, banks and other commercial concerns might sponsor the advertisements.

Results thus far due to the campaign have been most encouraging.

Traffic Committee To Meet

A meeting of the Traffic Committee of the National Plant Food Institute will be held October 7-8, 1959 at Houston, Texas. John S. Carlson, general traffic manager, Stauffer Chemical Company, New York, is chairman of the committee.

The business meeting of the committee is scheduled to be held in the Neches Room, Rice Hotel, Houston, on October 7. On the next day, the committee will be guests of the Texas Gulf Sulphur Company for a trip to view the sulfur mining and refining facilities of the company at Newgulf.

R. V. Peabody, general traffic manager of the Smith-Douglass Co. Norfolk, Va., is vice chairman of the traffic committee and Paul T. Truitt, executive vice president of the National Plant Food Institute, is secretary.

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Appoint Sales Engineer

The R. T. Vanderbilt Co., Specialties Department, New York, has appointed Russel J. Hahn as sales engineer. He will serve Vanderbilt accounts in the middle-Atlantic states, from Maryland north, including eastern Pennsylvania. He will cover New England and the Province of Quebec, in Canada.

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To Build 34th Plant

The Virginia-Carolina Corp.'s 34th fertilizer plant will be erected in Janesville, Ind. Mack Tune, of the V-C manufacturing department, will be plant superintendent.

G. F. Flenniken, former merchandising manager at V-C's home office in Richmond, Va., will be sales manager for the plant.

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Bemis Names Willmore

B. L. Willmore, head of the sales economic section and assistant secretary of the Bemis Bro. Bag Co., St. Louis, Mo., has been named assistant to the vice president in charge of procurement and materials.

Prior to assuming his duties in the company's Boston office, Mr. Willmore will attend the fall session of the Advance Management Program at the Harvard University graduate school of business administration.

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Florida Nitrogen Will Build

The Florida Nitrogen Company plans to build a granular fertilizer plant in Tampa, Fla. A contract has been awarded for the construction of the plant to the D. M. Weatherly Co., Atlanta, Ga.

Berkshire Names Two

Berkshire Chemicals, Inc., a subsidiary of the Vitro Corp., New York, has named Franklin E. Eck vice president of sales. At the same time, the firm appointed Robert E. Levitan manager of market research.

Mr. Eck had been with Spencer Chemical Co., Kansas City, Mo., and Mr. Levitan was with the Linde Co., a division of Union Carbide Corp., New York.

N. P. F. I. NEWS

Fertilizer Lack Indicated By Western Experiments

STUDIES conducted in four western states point out the need for more and beter use of commercial fertilizers, according to reports from the San Francisco office of the N.P.F.I.

Dr. Leroy Painter, associate agronomist at Wyoming State University, Laramie, said recently that fertilizer consumption in that state has increased during the past three years, but use must be stepped up further if the nutrients removed each year by crops are to be replenished. Dr. Painter was making a progress report based on a number of experiments being conducted by the Wyoming Agricultural Experiment Station.

The yield of ear corn at the Powell, Wyo., substation, Dr. Painter said, appeared to be directly proportional to the amount of nitrogen used. He cited other experiments on various crops in which yield increases also were credited to the use of fertilizer.

The annual application of nitrogen-phosphate fertilizer will increase forage production by three times that of unfertilized rangeland, according to Oswald K. Hoglund, manager of the government-sponsored Pleasanton Plant Materials Center, Alameda County, Calif. With an annual application of 200 pounds of fertilizer per acre, Mr. Hoglund said, the date of grazing readiness is advanced by six weeks and the green feed period is doubled.

Nevada soils are deficient in phosphate and nitrogen, according to Dr. V. E. Spencer, research chemist with the University of Nevada College of Agriculture, Reno, who said that, although fertilizer consumption in Nevada has gone up from 3,500 tons in 1954-55 to 22,000 tons in 1957-58, many farmers still are far from reaching the best potential use of fertilizers.

Recent experiments in barley culture are bringing to light new and vital information on the effects of irrigation, rate of nitrogen fertilization, and timing of application. Dr. Henry A. Schreiber of the Agricultural Research Service in Arizona reported on tests with California Mariout barley planted in loamy fine sand in December of 1957 and harvested the following June. By varying the time of the nitrogen applications, he said, it was possible to vary several important features of barley growth. Dr. Schreiber predicted that a formula soon may be derived to determine exactly when to apply nitrogen and water to barley for maximum yield at the least cost.

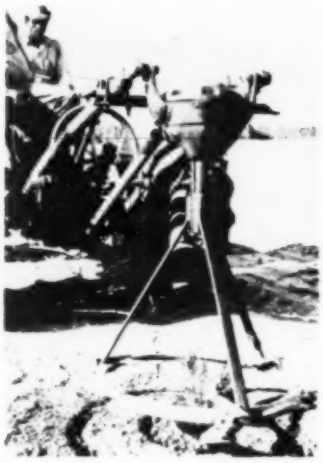
•

Study Pine Fertilization

Louisiana State University research workers recently completed initial treatments on 22 acres of Loblolly pine seedlings in new fertilization research projects at the North Hill Farm Experiment Station, Homer, La.

Dawson Johns, station superintendent, said that the primary objectives of the studies include the determination of levels and combinations of nitrogen, phosphorus, and potash that will bring about the greatest growth response, and the establishment of a basis for estimating nutritional requirements through soil and plant analysis.

A tractor mounted circular cultivating tool was developed at Homer for the studies. The cultivator makes an inner furrow in which phosphate is applied and an outer furrow in which nitrogen and potash are applied.



IMC Names Two Managers

Joseph J. Bozis has been appointed manager of customer service and Richard G. Powell is manager of technical service for the materials department of the new Agricultural Chemicals Division of the International Minerals & Chemical Corp., Skokie, Ill.

Mr. Bozis, formerly administrative assistant to the sales manager of the Feed Ingredients Department, has been with IMC for six years. Mr. Powell had been director of technical services for the Mississippi River Chemical Co.

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Joins Naugatuck Staff

Dr. Bogislav von Schmeling, a research plant pathologist, has joined the agricultural chemical research and development staff of the Naugatuck Chemical Division, United States Rubber Co. He will be stationed at the division's experimental farm in Bethany, Conn.

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Multiwall Bag Salesman

Donald W. Rauch has been appointed midwestern sales representative for the multiwall bag line of the Continental Can Co., New York. Mr. Rauch will maintain his headquarters at the company's Container board and Kraft Paper Division office in Chicago.

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Group Lists Objectives

The Illinois Fertilizer Industry Association, which was formed last June 29 at Urbana, Ill., has listed as its objectives the encouragement and promotion of research in educational programs designed to provide Illinois farmers with information on sound and economical use of soils and fertilizers in crop production.

Robert A. Weis, Virginia-Carolina Chemical Corp., East St. Louis, Ill., chairman of the association, said that the association will provide a forum for educational problems and other matters which are of vital interest to the entire industry. The purpose of the new group, Mr. Weis said, is to establish an area of cooperation that will result in harmony between all segments of the industry.

Other officers of the association are: John Abbott, Ashkum Co.; vice-chairman; Lowell Glendening, Federal-Danville Co., secretary; and H. L. Stangel, Darling & Co., treasurer. Members of the executive board include: Steve Turner, Pontiac, Ill.; Cecil Baylor, Sullivan, Ill.; Robert Vess, U. S. Steel, Chicago; M. Mawhinney, Smith-Douglass, Streator, Ill. and R. M. Morehead, Olin-Mathieson, St. Louis.

Reorganize Shell Laboratory

The Shell Chemical Corp. has reorganized its Union, N. J., technical service laboratory along product lines. Appointed under F. S. Swackhamer, laboratory director, as managers are R. F. Buller, industrial chemicals; C. M. Reider, plastics and resins; and E. S. Loeffler, agricultural chemicals.

E. F. Eckman, formerly office manager of the laboratory, was named manager of administrative services.

Stone-Fruit and Nut Pest Eradicated From United States

A portable applicator blows hydrocyanic acid gas into a gas-tight tent, shown here being suspended over fruit trees infested with Hall scale. The gas is the only certain killer of this tiny insect which is destructive to stone fruits and trees.

UNLESS continuing inspections turn up live insects during the next year, the Hall scale—a tiny but destructive stone-fruit and nut insect pest-can be considered wiped out in the United States, the U. S. Department of Agriculture announced last month.

Hall scale was a threat for many years to West Coast commercial orchard and ornamental plantings. If not checked, it could have eventually become a threat to the entire $267 million stone-fruit industry of the United States. Annual losses by growers might have amounted to millions of dollars for control alone, say USDA scientists.

No Hall scale has been found since 1957, when the last trees in north-central California known to be infested by the insect received a final fumigation treatment.

ARS pest control officials are cautious about claiming eradication of any pest. If Hall scale has been wiped off the U. S. map, it joins the ranks of a number of other fruit pests eliminated before showing U. S. growers the full extent of their destructiveness. The Mediterranean fruit fly was eradicated from Florida in 1930 and again in 1957, after a second invasion. The parlatoria date scale was stamped out in the Southwest and the citrus blackfly was eradicated from Florida in the 1930's. Citrus canker, a bacterial fruit disease, was eliminated from the South in 1943.

In the Hall-scale tests, only 3/10 of 1 per cent of the trees inspected have been found infested—2,960 out of 1,036,645—since the start of the program in 1941. However, since other host trees on infested properties required removal or treatment, 17,784 trees were destroyed and 48,940 fumigated. In all, 42,514 properties in 4,601 blocks of the three California cities were inspected.

Since the last living insect is the crucial one in an eradication effort, surveys must continue as insurance against any survival. They may be the most important yet conducted against the Hall scale. If no live insects turn up, it will still be 1960 before eradication can be considered certain. Meanwhile, plant quarantine inspectors continue to intercept the pest occasionally on foreign-grown plants at U. S. ports of entry.

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U. S. Releasing Pyrethrum

The U.S. General Services Administration is negotiating with pyrethrum buyers for the sale of 66,000 pounds of extract from the national stockpile. This is the third time since 1956 that the government has released pyrethrum from the stockpile that is maintained for use in the event of a national emergency.

It is expected that about 60,000 pounds of the extract will be sold to four or five regular importers and that the rest will go to small buyers. The extract is being offered at the prevailing market price and sales are expected to extend over a twelve-month period.

Mosquito Spraying Delayed

A delayed spraying program coupled with an unusual wet-weather-tide cycle condition has made it a wonderful summer for mosquitoes in New Jersey, according to Daniel M. Jobbins, a research entomologist on the staff of the Agricultural College at Rutgers University, New Brunswick, N. J.

Mr. Jobbins said that the insects had not been so numerous along the New Jersey tidewater in five years. Airplanes were scheduled to spray the mosquito haunts in late June, but the state decided last year to list its $135,000 mosquito control appropriation in the budget of the Department of Conservation instead of in the appropriation for the agricultural experiment station. In the changeover, the take-off of the spraying planes was delayed. The spraying started late in July, but, according to Mr. Jobbins, it was not as effective this year as it was last year.

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Named To New Post

Charles H. Sommer has been elected to the newly-created position of executive vice president of the Monsanto Chemical Co., St. Louis, Mo. He also was elected to the board of directors and the company's executive committee.

Mr. Sommer has been with Monsanto since 1934 and has been a vice president and general manager of the Organic Chemicals Division since 1954. He is succeeded in that post by Robert M. Morris, formerly assistant general manager.

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U. S. Imports Beetles

Beetles that prey on the balsam woolly aphid are being introduced into the U. S. from Germany in an attempt to control this forest-destroying insect, the U. S. Department of Agriculture reported last month.

Arrangements have been made to obtain approximately 20,000 of these beetles, *Laricobius erichsonii*, for use in a pilot control test in Maine and for the establishment of a colony in North Carolina. Severe losses of fir trees due to balsam woolly aphid have been recorded in Washington, Oregon, Maine, and North Carolina.

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Named Washington Manager

Stanley A. Mattison has been appointed Washington manager for the Hooker Chemical Corp., Niagara Falls, N. Y. He has established Hooker offices at 801 19th St., N.W. Washington 6, and will provide direct liaison between governmental agencies and Hooker in all areas of company business.

New Leader Distributor

P & R Truck Equipment Company, El Paso, Texas is a new distributor for Highway Equipment Company, Cedar Rapids, Iowa. They will handle "New Leader" lime spreaders, combination lime and fertilizer spreaders, wide spread lime and fertilizer spreaders, and mobile blenders.

P & R Truck Equipment Co. serves the El Paso area. Address of the new distributor is 1801 Olive Street, El Paso, Texas.

Fertilizer Placement Is Topic Of California Conference

LAND, water, and people are prime factors in the development of any agricultural enterprise and certainly have been involved significantly in the growth and character of California agriculture, said Dr. Daniel G. Aldrich Jr. who spoke at the seventh annual California Fertilizer Conference, June 29, on the campus of the University of California's College of Agriculture, Davis.

Sponsored by the Soil Improvement Committee of the California Fertilizer Association, the conference attracted 200 persons.

Howard H. Hawkins, president of the association, pointed to the progress of the fertilizer industry since he became a part of it in 1946. At that time, he said, less than a half million tons of commercial fertilizer were used annually in California. Now, however, through steady and healthy growth, the state's consumers purchase more than a million tons per year.

Information concerning the most effective placement of fertilizer on bed-grown vegetables was presented by Dr. Oscar A. Lorenz, vice chairman, Department of Vegetable Crops, U. of Calif., Riverside, who outlined the movement in the beds of the principal types of material being used today. He said that there is not one best location in the soil to place fertilizers for all crops and conditions.

Dr. Ormund Lilleland, pomologist, U. of Calif., Davis, discussed proper fertilization practices in deciduous tree fruit orchards. Dr. James A. Cook, viticulturist, U. of Calif., Davis, reported on recent fertilizer tests in the several grape producing areas of the state. Also, Aldo D. Rizzi, extension pomologist, U. of Calif., Davis, displayed a series of color slides showing nutritional deficiency symptoms in commercial orchards, as well as results following corrective treatment.

A panel on fruit tree and vine nutrition was moderated by Millard E. McCollam, chairman of the association's soil improvement committee and western manager of the American Potash Institute, San Jose. Panel members were: Dr. Ormund Lilleland; Dr. Carl J. Hansen, pomologist, U. of Calif.; Aldo D. Rizzi; Dr. James A. Cook; and Vincent E. Petrucci, head of the viticulture department, Fresno State College, Fresno.

Dr. J. E. Knott, chairman of the department of vegetable crops, U. of Calif., Davis, moderated a panel on fertilizer placement. Others on the panel included: Dr. Malcolm H. McVickar, chief agronomist, California Spray-Chemical Corp., Richmond; Dr. O. A. Lorenz; Dr. D. S. Mikkelsen, associate agronomist, U. of Calif., Davis; Dr. John C. Lingle, department of vegetable crops, U. of Calif., Davis; and F. J. Hills, extension agronomist, U. of Calif., Davis.

Dr. Aldrich spoke following a banquet and reviewed the development of California agriculture from the days of the Spanish missions, presidios, and pueblos established between 1769 and 1821, to the present time. Looking to the future, he said that, during the next ten years, a total of more than one million new irrigated acres can be brought into production in California.

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U.S.I. Concrete Tank

A reinforced concrete phosphoric acid storage tank with a capacity of over a million gallons has been completed at Tuscola, Ill., site of a wet-process phosphoric acid plant of the U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corp., New York.

The tank, one of the largest ever constructed for phosphoric acid storage, measures 100 feet in diameter and is 21½ feet high.

MEETING CALENDAR

Sept. 10 — New Pesticides Review. Sponsored by Western Agricultural Chemicals Assn., Fresno Fairgrounds, Fresno, Calif.

Sept. 13-17 — American Chemical Society, 136th national meeting. Fertilizer and Soil Chemistry sessions at Haddon Hall Hotel, Atlantic City, N. J.

Sept. 20-24—Canadian Agricultural Chemical Assn., Chateau Frontenac, Quebec, Canada.

Sept. 24-25 — Annual Northeastern Fertilizer Conference, National Plant Food Institute, Biltmore Hotel, New York.

Sept. 30-Oct. 1—Southeastern Fertilizer Conference, Biltmore Hotel, Atlanta, Ga.

Oct. 7-8 — Industry Symposium, "Research Progress on Insect Resistance", Hotel Mayflower, Washington, D. C.

Oct. 13-14 — Western Agricultural Chemicals Assn., fall meeting, Villa Hotel, San Mateo, Calif.

Oct. 14-16—Pacific Northwest Plant Food Assn., annual convention, Chinook Hotel, Yakima, Wash.

Oct. 15-16—Chemical Control Conference and Fertilizer Control Officials Meeting, Shoreham Hotel, Washington, D. C.

Oct. 19-20—Fertilizer Safety Section, National Safety Conference, LaSalle Hotel, Chicago.

Oct. 21-23—National Agricultural Chemicals Association, 26th Annual Meeting, French Lick-Sheraton Hotel, French Lick, Indiana.

Oct. 27-29—Florida State Horticultural Society, Everglades Hotel, Miami, Fla.

Oct. 29-30 — Eastern Branch, Entomological Society of America, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

Nov. 2-4—Canadian Manufacturers of Chemical Specialties, second annual meeting, Royal York Hotel, Toronto, Canada.

Nov. 4-6—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D. C.

Nov. 8-10—National Fertilizer Solutions Assn., annual convention, Statler Hilton Hotel, St. Louis, Mo.

Nov. 9-11 — California Fertilizer Assn., 36th Annual Convention, Fairmont Hotel, San Francisco.

Nov. 12-15—Texas Aerial Applicators Association, Orange House, Orange, Texas.

Nov. 16-20 — National Aviation Trades Assn., 20th Annual Convention, Hotel Monteleone, New Orleans, La.

Nov. 30-Dec. 2 — Carolinas-Virginia Pesticide Formulators Assn. Carolina Hotel, Pinehurst, N. C.

Nov. 30-Dec. 3—Joint meeting of Entomological Society of Canada and Entomological Society of America, Detroit, Mich.

Nov. 30-Dec. 2 — Soil & Crop Science Soc. of Florida, Gainesville, Fla.

Dec. 7-9 — 46th annual meeting, Chemical Specialties Manufacturers Assn., Mayflower Hotel, Washington, D. C.

Dec. 7-10—Western Canadian and North Central Weed Control Conferences, Royal Alexandra Hotel, Winnipeg, Manitoba, Canada.

Dec. 9-11 — International Crop Protection and Pest Control Exhibition, Seymour Hall, St. Marleybone, London, England.

Jan. 6-8—Northeastern Weed Control Conf., 14th annual meeting, Hotel New Yorker, New York.

Jan. 14-16 — California Agricultural Aircraft Association, 10th Annual Convention, El Mirador Hotel, Palm Springs, Calif.

Jan. 13-15 — Agricultural Ammonia Institute, 9th Annual Convention, Statler-Hilton Hotel, Dallas, Tex.

Jan. 20-21 — Northwest Agricultural Chemicals Industry Conf., Benson Hotel, Portland, Ore.

Equipment, Supplies, Bulletins

Sift-Proof Automatic Bags Offered By Continental Can

The Automatic Flav-O-Tainer, a sift-proof bag with heat-sealed construction and a flat block bottom, now is being offered by the Flexible Packaging Division of the Continental Can Co., in capacities ranging up to 25 lbs.

Shown here are two of the bags. One is a two-pound size used for a Du Pont weed and brush killer and the other is a five-pound bag that packages an insecticide made by California Spray-Chemical Corp.

Originally developed as a coffee package, the bags offer moisture retention or prevention of moisture pick-up and are sift-proof. They are the first intermediate sized bags to be offered in the automatic style.

CCC-Diluent Literature

The Calcium Carbonate Co., Quincy, Ill., has prepared a series of data sheets describing its "new" CCC-Diluent, in which the fines have been substantially reduced in the milling and classification process. As a result, the company states, drift is retarded, flowability is increased, and toxicant exposure in finished dusts is improved.

The data sheets are available from the company at 520 South Fourth St., Quincy.

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Carbide Solvents Booklet

A 40-page booklet, describing the properties and uses of Cellosolve and Carbitol glycol-ether solvents, has been published by the Union Carbide Chemicals Co., Division of the Union Carbide Corp., New York.

The booklet contains comprehensive data for 14 glycol-ether solvents, including physical properties, chemical derivatives, end-use possibilities, storage and handling, physiological properties, specification limits, and test methods.

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Cross Belt Extractor

A Magni-Power Cross Belt Extractor, that removes tramp metal contamination without ever coming in contact with a flow line, is being offered by the Magni-Power Co., Wooster, Ohio.

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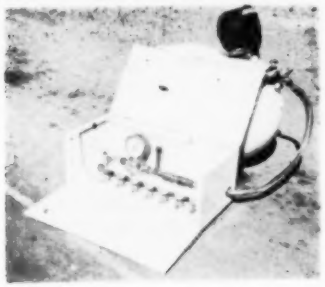
Antara PVP Booklet

Antara Chemicals, a sales division of the General Aniline & Film Corp., New York, has published a booklet describing the effectiveness of polyvinylpyrrolidone (PVP) in reducing the toxicity and sensitivity problems inherent in phenols and other compounds.

The experimental data summarized in the booklet shows how PVP tempers the effect of certain poisons, drugs, detergents, and germicides. The 8-page booklet (TA-52) is available from the company at 435 Hudson St., New York 14.

Bulk Fumigant Applicator



Ferguson Fumigants, Inc., Ferguson, Mo., has introduced the Dawson bulk fumigant applicator for the application of Ferguson's Dawson 37 (30 per cent ethylene dibromide, 70 per cent methyl bromide) fumigant mixture into grain bins, cereal processing plants, and warehouses.

From the bulk tank on the Dawson bulk fumigant applicator, which may be mounted either on a small trailer or small truck, liquified gas passes through a meter that records directly in pounds the amount of fumigant applied. From the meter, the fumigant passes into a valve header to which is attached a multiple of outlet valves connected to light weight plastic tubes which carry the fumigant into a building.

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New London Bag Flattener

The New London Engineering Co., New London, Wisc., has introduced its Type 32 bag flattener which is designed to flatten bags as they come from filling machines. Basically a New London conveyor belt with an inverted upper conveyor belt that flattens bags that pass between, the flattener is available in belt widths from 8 to 24 inches.

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Non-Technical Booklet

A non-technical booklet, giving in some detail a businessman's viewpoint on the production of liquid fertilizer solutions, has been prepared by the Chemical Plants Division of Barnard & Leas Mfg. Co., Cedar Rapids, Iowa.

The folder gives a summary of the trend towards liquid fertilizers, the opportunities offered by the industry today, and a general "profit picture" in the operations of a liquid fertilizer plant.

•

Shrub Protectant Folder

The Plant Products Corp., Blue Point, L. I., N. Y., has prepared a dealer catalog sheet on its new product "Sav-Shrub." Primarily a fall item for the protection of evergreens and other outdoor stock from winter injury, Sav-Shrub, when sprayed on shrubs in October or November, is said to put a thin coat on the shrub which normally lasts all winter.

•

Dust Control Information

New data and information on dust control with Torit cyclone separators is available from the Torit Manufacturing Co., St. Paul, Minn.

Carbide Organic Acid

The Union Carbide Chemicals Co., division of the Union Carbide Corp., New York, is offering isodecanoic acid (mixed isomers) in commercial quantities. The new acid is a complex mixture of methyl-substituted, ten-carbon, aliphatic, monocarboxylic acids having relatively little alpha substitution. The principal isomers are trimethyl-heptanoic and dimethyl-octanoic acids.

H. William Kopp, Jr. has been appointed works manager and Theodore T. Garrett has been named technical superintendent at the Columbia, Tenn., plant of the Phosphorus Division of Hooker Chemical Corp.

READERS DIGEST

(*From Page* 51)

said an article by Peter Farb, condensed from *American Forests*, "the results could be devastating: an estimated 15 billion dollars just for removal and burning of stricken trees. Replanting would cost billions more." The control employed was spraying the elms with a protective coating of DDT, to attack the beetle carrier of the elm disease rather than the disease itslf. Successful control efforts in Greenwich, Conn., Greenfield and Brookline, Mass., etc. were detailed, and the author noted that "cities and towns in the infected area have consistently proved that control programs can save the elms."

The *Digest* was apparently going strong in '57 on articles dealing with the wonders of modern pesticide science, for in September, 1957, they followed with still another article on "The Great Fire-Ant Invasion", outlining the story of its control through the use of chlordane, dieldrin and heptachlor. This article, by Allen Rankin, condensed from *Farm and Ranch*, painted a hair raising picture of the menace of the fire ant.

(In the *RD* articles the villain is always jet black, and the hero pure and unsullied.) "The fire ant", they warned, "is one of the most conspicuous nuisances ever to threaten U. S. farmers and the citizenry at large. It damages practically all edible plants . . . It routs field hands trying to gather crops . . . these insatiable pests can kill new-born calves and pigs. They chase brooding hens from the nest and eat their chicks . . . The ants have spread so phenomenally that they now constitute a national menace . . . They have cost farmers and home-owners (in Alabama alone) an estimated 25 million dollars."

But, with the *Digest*, what may be the blessing of control of a menace one month, can, another month, and under the pen of another author, itself become the menace. Who was it said "Ah, consistency, thou art a jewel of great price?"★★

FERTILIZER VIEWS

(*From Page* 104)

of the granule and that distribution in the core is relatively uniform. More even distribution of salt is necessary if greater strength were required. There are practical difficulties in obtaining an even distribution, but of several methods examined, one is stated to show prospects of success.

If a granule is dried to a moisture content corresponding with the second critical point on the curve, and drying is arrested, the salt deposited in the outer layers of the granule will re-dissolve and slowly diffuse back into the interior. When diffusion ceases and drying is resumed the salt will then be deposited *in situ*.★★

SAFETY SCHOOL

(*From Page* 43)

thy discussion by L. L. Lortschner of Spencer Chemical Co.'s Columbus, O., plant. An "off the record" discussion of a new manual on job instruction training was included in the Chicago program. Later, when everything is in order, it is expected that the big book will be published and made available to fertilizer safety men.

Registered at the Chicago school were representatives of the following ten midwestern fertilizer manufacturing firms: F. S. Royster Guano Co., U. S. Industrial Chemicals, Wisconsin Farmco Services Cooperative, Swift & Co., Smith-Douglass Co., Texaco, Inc., Davi-

son Chemical Co., Northwest Co-operative Mills, Koos & Son Co., and Michiana Chemical Co.

The Chicago school was the second in this year's series of five regional training courses, all sponsored by NPFI with cooperation from the National Safety Council. The first had been held at Ithaca, N. Y., in the week preceding the Chicago meeting, the third was held at Atlanta, Ga., Aug. 28-29. Next to come is the far western school at Fresno, Calif. Oct. 29-30 and the series for 1959 will wind up Nov. 15-16 at Houston, Texas.

HERBICIDE PATENT

(From Page 47)

1. The pellet incorporating the herbicidal material had to be of such weight and size that under normal conditions of application the dangers due to air drift would be materially minimized.
2. Manufacture had to be controlled so that each pellet would carry an adequate and substantially the same quantity of the herbicidal ingredient to achieve uniform distribution.
3. The carrier medium must be such that on contact with the ground it will release the hormone substance within a reasonable time, and the carrier must be compatible with the active ingredient.
4. The temperature of the granulating process must be controlled to avoid a heat materially perjudicial to the herbicidal ingredient.

As to physical characteristics of the resulting product, the pellets developed by the inventor were of such a size that they would pass through a 10 mesh B. S. sieve, but be retained on an 80 mesh B. S. sieve. Binding agents may be employed to prevent the pellets from dusting. Methyl cellulose is mentioned as such a suitable material. The carrier medium may or may not include a fertilizer.

While it is obviously premature at this point to attempt to reach any final opinion on the validity of the patent and the firms whose activities would be affected by it, it is generally considered that, if sustained on court test, its scope would be limited to hormone type herbicides of granular form. Producers of other type herbicides indicate that they believe that there would be no restrictions on their products under the patent. The companies that manufacture hormone type pesticides include such firms as Dow Chemical Company, Chemagro Corp., Monsanto Chemical Co., Chipman Chemical Co., Stauffer Chemical Co., Reasor-Hill, Thompson - Hayward, Riverdale Chemical Co., Thompson Chemicals and others.★★

ORCHARD PESTS

(From Page 46)

A significant increase in the set on Bartlett pear trees during poor pollinating weather was obtained by spraying them with 5 ppm of 4,5T-P, Dr. Melvin Westwood, USDA horiculturist, reported. In another test block which was in bloom during good pollinating weather, 7½ ppm of the same material provided only a mild increase in set.

Chemical thinning of pears is under test, but no results are ready for report.

Use of various chelates to overcome micro-nutrient deficiencies has resulted in the development of some lignin-based materials, it was brought out. (Lignin is a by-product - formerly a bothersome waste - in paper-making.) The lignin-based materials tested were not phytotoxic, the scientists reported.

Where zinc deficiency symptoms are noted in the orchard, the zinc should be applied during the dormant season—"Don't wait till the buds start to break in March," Dr. Nels R. Benson, soil scientist and horticulturist at the tree fruit experiment station, told the or-

chardists. If the zinc deficiency is particularly severe, applications can be made both in the fall and early spring, he added.

Eastern scientists have discovered that where animal manure is used, zinc is taken into such a "tight" chemical combination that it is unavailable to the trees, Dr. Nelson reported. Although zinc in too great quantity can be harmful, annual applications of the material at recommended dosages have been made for at least six years without any harmful effects being apparent.

Boron applied at the rate of 5 pounds per acre (½ pound per 100 gallons of water) in the first cover spray is helpful where boron deficiency is apparent. In some sandy soils, there is a tendency for the trees to get too much boron when it is applied as a spray.

Many reports were received by the Washington State College department of entomology early this year about mysterious deaths of thousands of bees in the orchard districts, Dr. Horace Telford, head of the department, commented in his talk to the growers during the tour of the Yakima area. Investigation revealed that about the only nectar source available to the bees early in the spring was in weeds blooming in the orchard covercrops. In many instances, insecticides had dripped onto the ground from the trees, causing the loss of thousands of bees.

Dr. Telford recommended that orchardists mow their covercrops before applying insecticides in the period before their orchard trees start blossoming.

Approximately 1,000 growers and others interested in the fruit industry attended some or all of the week-long tours which visited the major apple and pear-producing sections of the state. Illness of Dr. John C. Snyder, Washington state extension horticulturist, and of David Brannon, state extension entomologist, deprived the growers of their expert observations for the first time in almost two decades.

Among those who participated in at least some of the tours were growers from British Columbia as well as from Oregon and Idaho, and several horticulturists from Poland, Israel and Korea. ★★

LISTENING POST

(*From Page* 97)

tionship, however, as the date when the injury first appeared in the orchard was not known.

On September 20 three random-selected hand-picked bushels of apples from each tree in each plot were scored for insect, disease, and other blemishes. The counts are given in Table 1. Cyprex gave excellent control of scab, but the severe fruit injury already mentioned resulted in more than 20 percent heavy fruit russet on all varieties. In comparison with the standard captan treatment the percentage of clean fruit in the Cyprex plots was significantly low.

1958 Tests:

In the 1958 tests Experimental Fungicide 23411 was added. Design of the experiment and methods of application were as in 1957.

Dates of application were April 23,29; May 5, 8, 19, 22, 28; June 5, 12, 26; July 7, 15, 28; August 4, 21, 27. Petal fall occurred on May 22. As in 1957 malathion 25W and methoxychlor 50W were included in the sprays from petal fall on.

Through petal fall Cyprex 70W and E. F. 70W were each used at three different rates, namely ½, 1, and 1½-100. After petal fall the two higher rates were reduced to ½-100. Dosage rate of captan 50W was 2-100 through petal fall and 1-100 in later sprays.

The leaf spot count made on June 10 again showed excellent scab control. The average number of spots per tree was: for McIntosh—check, 78.1; captan, 0.3; E. F. 23411 1-100, 0.1; Cyprex 1-100, 0.1; Cyprus ½-100, 0.2; for Cortland—check 63.2; Cyprex ½-100, 0.1; for Delicious—check 51.7; captan 0.2;

Table 2

Insect, disease and other types of blemish counts made at harvest—September 17, 1958. (Table of Tunis and Sudds)

Treatment	Variety	Percent clean	Percent scab	Percent light russet	Percent heavy russet	Percent insect damaged
	McIntosh	90.1	0.0	5.4	0.7	3.9
Cyprex 70W ½-100	Cortland	86.2	0.0	4.6	1.5	7.8
	Delicious	84.9	0.7	4.5	0.0	9.9
	McIntosh	86.4	0.0	5.3	0.7	7.6
Cyprex 70W 1-100	Cortland	82.9	0.7	4.1	0.6	11.7
	Delicious	92.3	0.0	0.0	0.6	7.7
	McIntosh	88.3	0.0	3.6	2.9	5.2
Cyprex 70W 1½-100	Cortland	87.7	0.0	6.5	0.7	5.1
	Delicious	95.5	0.0	1.5	0.0	3.0
	McIntosh	89.6	0.8	6.4	0.0	3.2
E. F. 23411 70W ½-100	Cortland	86.6	0.0	7.0	1.5	4.9
	Delicious	86.4	0.0	7.6	0.0	6.0
	McIntosh	87.1	0.0	4.8	1.6	6.5
E. F. 23411 70W 1-100	Cortland	89.0	0.0	1.5	0.8	8.7
	Delicious	90.0	0.0	2.5	1.0	6.5
	McIntosh	82.7	0.0	10.8	0.0	6.5
E. F. 23411 70W 1½-100	Cortland	85.4	0.0	5.6	1.6	7.3
	Delicious	86.3	0.0	6.8	0.0	6.9
	McIntosh	84.5	0.9	4.4	1.1	4.9
Captan 50W 2-100[a]	Cortland	86.2	0.0	3.2	0.3	6.1
	Delicious	87.4	0.2	6.1	2.1	5.2
	McIntosh	0.0	85.5	—	—	51.3
Check	Cortland	0.0	89.7	—	—	61.2
	Delicious	0.0	88.3	—	—	51.2

[a]Captan 50W included in trials as a standard treatment. Dosage rate up to petal fall 2-100; after petal fall, 1-160.

E. F. ½-100, 0.1. No scab spots were observed in other treatment plots.

There was no injury similar to that noted in 1957. The lowest temperature recorded during May and June was 45°F.

Data from the harvest counts, which were made on September 17, are given in Table 2. Both Cyprex and E. F. 23411 at all dosage levels were very effective in controlling scab. The lowest rate of application, ½-100, gave as good results as the higher rates in these tests.

Judging from the results of their single year's tests the authors consider E. F. 23411 to possess much promise as a material for the control of apple scab. Its performance was very like that of Cyprex.

1958 Tests of Compatibility with Insecticides and Miticides:

The authors tested a number of insecticides and miticides in combination with Cyprex to evaluate effects of the combination sprays from the standpoint of fruit and foliage injury. They noted no injury from any of the test combinations. Cyprex apparently was compatible with each of the materials used, which included Guthion, Diazinon, Sevin, DDT, lead arsenate, Kelthane, Aramite, methoxychlor, and malathion. ★★

HANDLING LIQUIDS

(From Page 57)

(P_2O_5) of the complete mixed fertilizers can be used more efficiently if it is applied in bands either on the surface or below the surface of the soil. Such application produces concentration of fertilizer phosphorus which results in a higher availability of plant nutrients. It follows that dribbling fertilizer phosphorus on the surface of the soil in bands a few inches

apart could accomplish the same result.

Corrosive Effects

The complete fertilizer solution in most cases is considered to be a neutral solution. A number of liquid fertilizer dealers now are handling complete liquid fertilizer in mild steel containers. It is their belief that they can live with a certain amount of etching and replace the containers after a few years more cheaply than they could buy containers constructed of stainless steel. Considerable research has been conducted on the matter of coating mild steel to protect it from the damaging effects of fertilizer. Manufacturers now are supplying tanks coated with a resin, either baked or air dried. It should be borne in mind, however, that a small uncoated surface can make a tank worthless.

Transferring Liquids

Transferring a chemical from nurse tank to the applicator in many cases can be accomplished by increasing the pressure on the nurse tank by an air compressor. A number of dealers are using centrifugal pumps successfully. Others have been able to employ the roller impeller pump to advantage. Quick couplings are used by most progressive dealers and applicators. Down time is being reduced by larger (2½ to 3 inch) hose and pipe transfer lines.★★

TREATING CRANBERRIES

(*From Page* 59)

ing is carried out by two men, one on each side of the helicopter, who empty bags of pesticide dusts into the hoppers. This takes about one minute and the helicopter is ready to take off for the next dusting run. A dusting run over the bog takes about five minutes.

The pilots endeavor to keep the helicopters from one to four feet above the tops of the cranberry vines. With the closeness to the bogs, and the lifting up and setting down as the helicopter hops over dikes on each bog, the pilot, plane, and load must all be "in tune". A dust load weighs from 300 to 400 pounds, depending on weather, "motor feel", etc. Application takes less than a minute per acre, not including all time involved in other steps of the operation.

Among the chemicals used to control pests of cranberries are; Pyrethrum, Dieldrin, Chlordane, Kerosene, Malathion, DDT, Parathion, Ferbam, Zineb, Bordeaux mixture, Rotenone, Ryania, arsenate of lead, and nicotine dust. These are used to control such pests as; root grub, white grub, cranberry scale, mealy bug, tipworm, sparganothis fruitworm, black-headed fireworm, false armyworm, blossom worm, weevil, yellow-headed fireworm, cutworms, green spanworm, girdler, blunt-nosed leafhopper, and cranberry fruitworm. In addition, diseases such as fruit rot are being chemically controlled. Also, in recent years, helicopters have been used to apply an ever-increasing amount of fertilizers.

Weed killing also is largely a chemical operation, although some hand weeding still is done. Chemicals applied by helicopter for weed control include iron sulfate, salt, copper sulfate, water white kerosene, Stoddard solvent, 2,4-D, nitrate of soda, and 2,4,5-T. Weeds common to cranberry bogs are; hair cap moss, sensitive fern, royal fern, cinnamon fern, sand spurrey, tear-thumb, long leaf asters, wild bean, nutgrass, green scum (algae), hoary alder, sweet gale, bayberry, dulichium, sedges, wool grass, spike rush, poverty grass, rushes, loosestrife, three square grass, hardhack, leather-leaf, and various bushes on shores and dikes. ★★

SPRAY CHARACTERISTICS

(*From Page* 40)

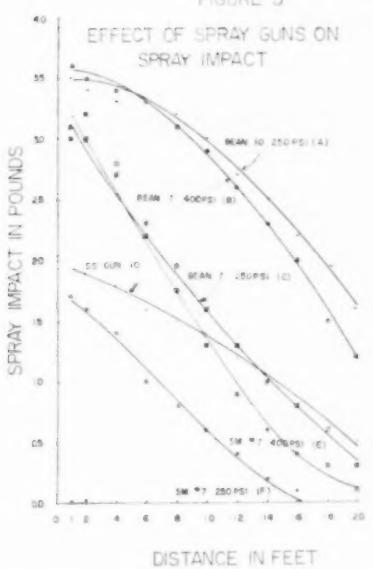
mal at right angles to the spray operator. Do not try to spray the back from ground level. The gun must be above the back to gain high impact. Similarly, do not try

to spray the flank from a position directly above the back. Some latitude is permissible, but the spray stream should generally strike the animal so that the stream forms a right angle with the target and does not deviate more than 30° from a right angle.

This is not reported as an exhaustive investigation of the principles of spraying. It is intended to demonstrate that a high pump pressure is not the only important part of spraying. Nozzles are not all alike. Guns using the same tip gave different amounts of impact. The factors discussed do demonstrate that there are certain basic rules to consider in the proper application of a livestock systemic. In spraying Co-Ral, it would be useful to keep the following seven suggestions in mind.

1. Use the highest available pump pressure, measured with the spray gun turned on.
2. Be as close to the animal as possible.
3. If the animal is immobilized, as in a chute, and the nozzle can be brought within a foot or two, the proper fan nozzle gives rapid and thorough wetting.

FIGURE 5



4. Spray streams hitting the animal at right angle penetrate best.
5. Be selective in the choice of spray guns. If possible, compare several guns under your spraying conditions and select the one which gives the greatest impact on the animal.
6. Avoid nozzles which give fine sprays or mists. A number 7 (7/64") disc delivers enough spray for good impact, with a minimum amount of waste in a good gun. Do not use a disc size smaller than 5/64".
7. Keep moving the spray gun. Spray penetrates only at the instant of contact. The hair quickly turns to shed the liquid and chemical.

A good spray treatment can be recognized by examining a sprayed animal. With a pocket comb, carefully spread the hair apart and look at the hair and skin. It is important to wipe the area to be examined with the edge of the hand to remove surface spray. Failure to do this will give an erroneous impression because the spray often runs down the hair to the skin as the hair is parted for examination. Hair that is not wet to the follicle indicates a poor spray job. Moisture and spray particles are visible on the skin in a good spray job.★★

LD-50 VALUES

(*From Page* 45)

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NO NITROGEN GRANULATION

(*From Page* 38)

grades could be produced readily in granulation plants where steam and phosphoric acid are available.

Storage Test Data

Data were obtained to evaluate the storage properties of the 0-14-14, 0-20-20, and 0-25-25 grades produced in the pilot plant. Tests were made in six-ply bags with one or two asphalt liners. All of the products were cured for at least one week prior to bagging. A summary of the results of the storage tests follows:

Products that were stored for 1 to 9 months without conditioning had only light to medium bag set and contained no lumps after the standard drop test. The bags usually failed when dropped, however. Coating of the granules with 2.5 per cent of a neutralizing conditioner, such as Kemidol, usually was effective in preventing bag attack. The cotton thread used for closure of the bags usually failed even when a conditioner was used. A specially resistant thread probably would be needed for the bags.

Bag-storage tests of the 0-30-30 and 0-40-20 grades are not yet completed; however, the appearance and low free-acid content of these products indicate that their storage properties should prove to be very satisfactory.

Corrosion Test Data

When phosphoric or sulfuric acid is used to acidulate phosphate rock in the production of no-nitrogen grades, the exhaust gases from the acidulating drum contain fluorine and hydrogen chloride. The evolution of both of these fumes is more pronounced when sulfuric acid is used, because of the liberation of a higher proportion of fluorine from rock, and greater reaction of sulfuric acid with potassium chloride to liberate hydrogen chloride. Metals and protective coatings were tested for resistance to exposure in the exhaust gas from the pilot-plant acidulating drum when 0-14-14 and 0-25-25 grades were produced.

The metals tested were mild steel, Type 316 stainless steel, and 2S aluminum. Protective coatings that were tested on mild steel were Bisonite No. 900 (a furan-base coating) and Nukemite No. 33 (a vinyl copolymer resin). The time of exposure was somewhat limited, but the data obtained should give an indication of the type of material that would be suitable for hoods and ducts.

The data indicated satisfactorily low rates of corrosion for mild steel, Type 316 stainless steel, and aluminum when phosphoric acid was used. Of the metals tested, only Type 316 stainless steel appeared to be suitable when sulfuric acid was used. The Bisonite coating on mild steel cracked, but the Nukemite No. 33 coating on mild steel appeared to be satisfactorily resistant to attack when either of the acids was used. A suitable coating of this type on mild steel probably would be the best solution to this corrosion problem, particularly if sulfuric acid is used.★★

WASHINGTON REPORT

(*From Page* 100)

ally-known authorities on pesticides and wildlife.

As has been customary, the second day of the meeting will be devoted to committee meetings. The third day will feature NAC and committee reports, and a full discussion of the new amendment placing nematocides, plant regulators, defoliants, and dessicants under the Federal Insecticides, Fungicide and Rodenticide Act.

* * * * * *

Census results that will be available sometime in 1960 will be a goldmine for nearly everyone except for pesticide manufacturers. The reason: the census contains no questions about pesticide purchase or use.

Lack of reliable industry-wide information on who uses pesticides, how much, and on what crops has long hampered industry marketing efforts. Some industry leaders, at least, believe areas for potential increases in pesticide sales exist, but without accurate market information it is next to impossible to find them.

Census figures could supply a valuable aid to agriculture and to the pesticide industry by including questions in this field as they already do on the use of dry and liquid fertilizers. Reason they don't gather such information, say Census Officials, is that the number of census questions must be limited and some things, unfortunately, must be left out.

With the upswing in importance of pesticides to sound, economical farm production, it appears logical that questions relating to pesticides should be included in any future census of agriculture.

* * * * *

The many rumors and thinly-supported claims of growing insect resistance to insecticides may well be laid to rest one way or another at a symposium scheduled for next month.

New scientific research data relating to "Research Progress on Insect Resistance" will be presented by some of the nation's top research authorities at the symposium sponsored jointly by NAC and the Entomological Society of America.

The symposium will be held in the Mayflower Hotel, Washington, D.C., October 7 and 8. ESA will publish the papers presented. This will be a highly technical symposium and, for that reason, may be limited to technical and management personnel.★★

AC

The War Eagle Lime Co., Inc., has been granted a charter of incorporation to deal in lime fertilizers. The corporation is located in Huntsville, Ark.

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The October Issue of AGRICULTURAL CHEMICALS

Goes to the NACA CONVENTION

The October issue of AGRICULTURAL CHEMICALS will be distributed to those attending the National Agricultural Chemicals Association annual convention at the French Lick-Sheraton Hotel in French Lick, Indiana, October 21 to 23.

The complete convention program and other special editorial features will appear in this important convention issue.

Take advantage of the extra convention circulation — with no increase in advertising rates — by scheduling a dominant advertisement in this issue.

Advertising deadline for October is September 10

AGRICULTURAL CHEMICALS

Caldwell CApital 6-5520 New Jersey

INDEX to ADVERTISERS

TALE ENDS

ANOTHER few weeks and we'll be taking off for the resort that Pluto Water made famous . . . or was it the other way around? French Lick, we have heard for years, is one of the biggest buyers of epsom salts in the country. When nature won't, Dow will.

AC

Our most recent direct line on Boss Taggart's old stamping ground was obtained back ten or fifteen years ago when we spent a sweltering few days there at a CSMA convention. In those days it wasn't too much—only about three bath rooms in the whole place, and all constantly in use. The report is that, since having been taken over by the Sheraton Chain, however, the place has been completely refurnished and is now a first rate resort hotel. Any way you figure it, it's bound to be an improvement over the Gen. Oglethorpe, scene of the '58 convention.

AC

Cuban dictator Fidel Castro is reported to be negotiating with American investors with a view to digging up American capital to finance a new fertilizer plant in the land where beards and machetes have now replaced rum and the rumba. We wonder who would be gullible enough to stick his neck out and get involved. Expropriation is one sufficiently discouraging threat, but even plant owners still allowed to operate, report that it isn't much of a privilege. They are being asked to shorten hours, raise wages and reduce prices — all at once, in Castro's drive to remain a hero with the populace.

AC

Crop dusters and agricultural applicators are looking to a panel reviewing, "New Business Opportunities for the Agricultural Applicator", to be offerred at the November meeting of the National Aviation Trades Association. Several representatives of pesticide manufacturing companies will appear on the panel, to comment on (1) new herbicides, insecticides, etc. which have been developed for the applicator; (2) new uses for existing products; (3) new applicator techniques, etc.

There are enough meetings to go to as it is, but attendance at the aerial applicator's gathering is becoming more and more important for those in the pesticide industry.

AC

The explosion in Roseburg, Ore., last month in which two tons of dynamite and four tons of a blasting agent, "Car-Prill" prepared from an ammonium nitrate base wiped out an area of several city blocks, will inevitably result in problems for firms handling fertilizer grade ammonium nitrate. Typical is an item in the "Deseret News" of Salt Lake City, Utah, in which staff writer M. G. Fairbanks writes: "Are you storing a fertilizer in your garage? Better take another look at it. It might be a potential explosive."

The Manufacturing Chemists' Association and the National Plant Food Institute were quick to issue clarifying statements emphasizing that the product involved was not fertilizer grade ammonium nitrate, which is NOT an explosive. (See page 107). ICC hearings are scheduled for Roseburg, Sept. 1, at which clarification should result as to just what happened and what materials were involved.

AC

The NACA has issue a special bulletin to members making suggestions on transportation arrangements for those attending the French Lick, session, October 21-23. Those coming by rail from the east can take one of two night trains on the B & O originating in Baltimore. For those coming down from Chicago, it's the morning train on the Monon Railroad. Nearest airport to French Lick is Louisville—67 miles—and the cab rate over is 30 bux for one to five persons. If you're planning to rent a car at Louisville, better get active right away. NACA has arranged to have a room reserved in its name at the Sheraton Hotel in downtown Louisville, where persons who wish to pool transportation from Louisville might get together.

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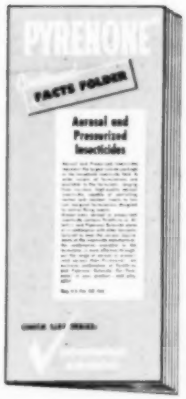

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